MOTOROLA

MAXAR®

Two-Way FM Radio

150.8-174 MHz

Instruction Manual

68P81025E70-E

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CUSTOMER QUESTIONNAIRE

To the Reader of This Instruction Manual:

Motorola is engaged in a continuous program of improving its instruction literature. We believe that you can aid us in this program, so that we in turn can better help you service our equipment. To foster these aims, would you please answer the following questions:

First Fold

SCHEMATIC DIAGRAMS AND CABLING DIAGRAMS

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1. ☐ Are accurate and easy to follow
2. ☐ Contain minor errors
3. ☐ Contain major errors
4. ☐ Are difficult to follow

If you have checked any box except 1, please tell us what schematic diagrams, or portions thereof, were at fault, or enter other comments.*

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68P85901D80-H

TEXT

1. ☐ Easy to follow – helps to service equipment
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(continued on reverse side)

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***Whenever possible, give complete model No. of equipment, and part No. of diagram or part No. of instruction section. This information is important.**

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To the User of this Manual:

Many servicemen have asked for smaller manuals with more servicing information on the schematic diagrams.

This manual uses a new approach which we feel fulfills this desire. The circuit descriptions and circuit maintenance data are now incorporated on the schematic diagram (or on a facing page).

First Fold

First Fold

This new approach makes the manual smaller as well as easier to use because it puts the information at the serviceman's fingertips.

We would appreciate hearing how you like the new approach after you have used the manual a few times. Please take a few minutes to give us your comments.

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AVAILABLE BACKGROUND REFERENCE PUBLICATIONS

Three reference publications are available to provide background information needed to service some of the newer Motorola products more effectively. The information in these publications is not duplicated in our instruction manuals. To obtain your free copy, check the ones you want and return this self–mailer to us. (NOTE: One copy of each publication has already been distributed to Motorola Service Shops (MSS's) and field technical representatives (FTR's).

First Fold

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Check item desired:

☐ **Basic Logic Circuit Guide** 68P81105E88

Describes the basic logic circuits used in Motorola Communications digital equip–ment and the logic notational scheme used in our instruction manuals.

68P81028E93–B

☐ **"Digital Private–Line" Binary–Coded Squelch** 68P81106E83

Contains fundamentals of "Digital Private–Line" system operation, circuit operation and servicing techniques.

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MAXAR
TWO-WAY FM RADIO

150.8-174 MHz

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Radio Set Parts List	68P81031E37
Exciter and 10-Watt Power Amplifier Schematic Diagram	68P81031E37
TLD2042A & TLD2043A 25-Watt RF Power Amplifier Schematic Diagram, Circuit Board Detail, & Parts List	68P81031E38

MOTOROLA INC.
Communications Division

service publications
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6/2/76-NPC

SECTION NUMBER

DIAGRAMS & PARTS LISTS (CONT'D)

TRN6177B "Private-Line" Encoder/Decoder
Schematic Diagram and Circuit Board Detail 68P81029E99
TMN1008A, TMN1009A, TMN1010A & TMN1011A Desk Microphone
Schematic Diagram, Circuit Board Detail, and Parts List 68P81030E06
TRN6207A Digital "Private-Line" Encoder-Decoder
Schematic Diagram & Circuit Board Detail 68P81030E07
Parts List & CMOS Handling Precautions 68P81030E07

SAFETY INFORMATION

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA), has established an electromagnetic radiation safety standard which applies to any two-way mobile radio equipment. Normal use of this radio will result in exposures far below the OSHA limit. There are no reported incidents of physical damage resulting from the use of this type radio. However, the following precautions are recommended:

DO NOT operate the transmitter when someone outside the vehicle is within two feet of the mobile antenna.

DO NOT operate the transmitter near unshielded electrical blasting caps or in an explosive atmosphere.

EPS-18196-B

SPECIFICATIONS

GENERAL

MAXIMUM BATTERY DRAIN @ 13.8 V	MODEL	TRANSMIT	RECEIVE	STANDBY (SQUELCHED)
	10-WATT	3 A	1.0 A	0.3 A
	25-WATT	6 A		
FREQUENCY RANGE		150.8-174 MHz		
DIMENSIONS		2-1/4" H x 6-1/2 " W x 8-1/2" D		
WEIGHT		10 WATT: 3.0 lbs, 25 WATT: 3.8 lbs.		

TRANSMITTER

RF POWER OUTPUT	10 WATTS	25 WATTS
SPURIOUS & HARMONIC EMISSIONS	56 dB below carrier	60 dB below carrier
OUTPUT IMPEDANCE	50 ohms	
FREQUENCY STABILITY	±0.0005%; -30°C to +60°C (+25°C reference)	
MODULATION	16F3	
AUDIO SENSITIVITY	160 mV ±3 dB for 3.0 kHz deviation at 1000 Hz	
FM HUM & NOISE	-70 dB below ±3.0 kHz deviation at 1000 Hz	
AUDIO RESPONSE	+1, -3 dB of 6 dB/octave pre-emphasis from 300 to 3000 Hz.	
AUDIO DISTORTION	Less than 3%	

RECEIVER

CHANNEL SPACING	30 kHz
SELECTIVITY -EIA SINAD	-70 dB @ ±30 kHz
EIA SINAD INTERMODULATION	-70 dB
EIA MODULATION ACCEPTANCE	±7 kHz
SENSITIVITY	0.35 uV or less for 20 dB quieting. 0.3 uV or less for 12 dB sinad.
FREQUENCY STABILITY	±0.0005%; -30°C to +60°C (+25°C reference)
SPURIOUS & IMAGE REJECTION	Greater than 70 dB
SQUELCH THRESHOLD SENSITIVITY	Less than 0.2 uV
AUDIO OUTPUT	3 watts, with less than 10% distortion
AUDIO RESPONSE	+2, -8 dB/octave de-emphasis from 300 to 3000 Hz.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

FCC TRANSMITTER LICENSE DESIGNATIONS

RF OUTPUT	SINGLE FREQUENCY	TWO FREQUENCY
10 Watts	CC3268	CC3269
25 Watts	CC3270	CC3271

FCC RECEIVER CERTIFICATION NUMBERS

SINGLE FREQUENCY: RC0103
TWO FREQUENCY: RC0104

MOTOROLA

MODEL CHART
FOR
"MAXAR"
FM TWO-WAY RADIO
150.8-174 MHz
10W & 25W RF POWER
+12 V MOBILE
117 V AC BASE STATION

CODE:

- ☒ = ONE ITEM SUPPLIED WITH EACH RADIO
- ▨ = ONE ITEM SUPPLIED WITH EACH RADIO DEPENDENT UPON FREQUENCY
- ⊙ ONE ITEM SUPPLIED FOR 10 OR LESS RADIO SETS
- ② NUMBER INDICATES QUANTITY SUPPLIED WITH EACH RADIO, DEPENDENT UPON FREQUENCY
- Ⓡ - REFER TO UNIFIED CHASSIS MODEL CHART FOR LOWER LEVEL KITS

MODEL NUMBER	DESCRIPTION	MOTIF NUMBER	NUMBER OF OPERATING FREQUENCIES	SQUELCH	RF POWER
			MOBILE MODELS		
*TUD1892AB	UNIFIED CHASSIS (150.8-162 MHz); 1-FREQ., 10-WATT	D23TRA1000AK	1	CARRIER	10 W
*TUD1893AB	UNIFIED CHASSIS (162-174 MHz), 1-FREQ., 10-WATT	D23TRA1300AK	1	CARRIER	10 W
*TUD1902AH	UNIFIED CHASSIS (150.8-162 MHz); 2-FREQ., 10-WATT	D23TRA3000AK	2	CARRIER	10 W
*TUD1903AH	UNIFIED CHASSIS (162-174 MHz); 2-FREQ., 10-WATT	D23TRA3300AK	2	"PRIVATE-LINE"	10 W
*TUD1912AB	UNIFIED CHASSIS (150.8-162 MHz); 1-FREQ.., 25-WATT	D23TRA6000AK	1	PRIVATE-LINE	10 W
*TUD1913AB	UNIFIED CHASSIS (162-174 MHz); 1-FREQ., 25-WATT	D23TRA6300AK	1	DIGITAL "PRIVATE-LINE"	10 W
*TUD1922AH	UNIFIED CHASSIS (150.8-162 MHz); 2-FREQ., 25-WATT	D33TRA1000AK	2	DIGITAL "PRIVATE-LINE"	10 W
*TUD1923AH	UNIFIED CHASSIS (162-174 MHz); 2-FREQ., 25-WATT	D33TRA1300AK	2	CARRIER	25 W
*TUD1982AB	UNIFIED CHASSIS (150.8-162 MHz) 1-FREQ., 25-WATT	D33TRA3000AK	1	CARRIER	25 W
*TUD1983AB	UNIFIED CHASSIS (162-174 MHz) 1-FREQ., 25-WATT	D33TRA3300AK	1	"PRIVATE-LINE"	25 W
*TUD2002AB	UNIFIED CHASSIS (150.8-162 MHz); 1-FREQ., 10-WATT	D33TRA6000AK	2	DIGITAL "PRIVATE-LINE"	25 W
*TUD2003AB	UNIFIED CHASSIS (162-174 MHz); 1-FREQ., 10-WATT	D33TRA6300AK	2	DIGITAL "PRIVATE-LINE"	25 W
TRN6207A	DIGITAL "PRIVATE-LINE" ENCODER/DECODER BOARD			BASE STATION MODELS	
TRN6005A	CODE PLUG	L33TRB1100AM	1	CARRIER	10 W
TRN6177B	"PL" ENCODER/DECODER BOARD	L33TRB1105AM	1	CARRIER	10 W
TLN6709B	"VIBRASPONDER" RESONANT REED	L33TRB1130AM	2	CARRIER	10 W
THN6244A	HOUSING	L33TRB3100AM	1	"PRIVATE-LINE"	10 W
TRN6204A	HARDWARE FOR 1-FREQ., "PRIVATE-LINE"	L33TRB3105AM	1	"PRIVATE-LINE"	10 W
TRN6206A	HARDWARE FOR 2-FREQ., CARRIER SQUELCH	L33TRB3130AM	2	"PRIVATE-LINE"	10 W
TRN6205A	HARDWARE FOR 2-FREQ., "PRIVATE-LINE"	L33TRB6100AM	1	DIGITAL "PRIVATE-LINE"	10 W
TRN6211A	ESCUTCHEON FOR 1-FREQ., CARRIER-SQUELCH	L33TRB6105AM	1	DIGITAL "PRIVATE-LINE"	10 W
TRN6212A	ESCUTCHEON FOR 2-FREQ., CARRIER SQUELCH	L33TRB6130AM	2	DIGITAL "PRIVATE-LINE"	10 W
TRN6213A	ESCUTCHEON FOR 1-FREQ., "PRIVATE-LINE"	L43TRB1100AM	1	CARRIER	25 W
TRN6214A	ESCUTCHEON FOR 2-FREQ., "PRIVATE-LINE"	L43TRB1105AM	1	CARRIER	25 W
TRN6215A	ESCUTCHEON FOR 1-FREQ., DIGITAL "PRIVATE-LINE"	L43TRB1130AM	2	CARRIER	25 W
TRN6216A	ESCUTCHEON FOR 2-FREQ., DIGITAL "PRIVATE-LINE"	L43TRB3100AM	1	"PRIVATE-LINE"	25 W
TPN1136A	AC POWER SUPPLY	L43TRB3105AM	1	"PRIVATE-LINE"	25 W
TRN6223A	BASE TRAY	L43TRB3130AM	2	"PRIVATE-LINE"	25 W
TKN6842A	CABLE, INTERFACE PAGING BASE	L43TRB6100AM	1	DIGITAL "PRIVATE-LINE"	25 W
TKN6794A	POWER CABLE (25 W MODELS)	L43TRB6105AM	1	DIGITAL "PRIVATE-LINE"	25 W
TRN6209A	INSTALLATION KIT	L43TRB6130AM	2	DIGITAL "PRIVATE-LINE"	25 W
TAD6112A	ANTENNA (144-152 MHz)				
TAD6113A	ANTENNA (152-162 MHz)				
TAD6114A	ANTENNA (162-174 MHz)				
KXN6121AA	CRYSTAL, XMTR				
KXN6122AA	CRYSTAL, RCVR				
TRN6210A	TUNING TOOL				
TMN6104A	MICROPHONE				
TLN4839A	MICROPHONE HANG-UP KIT				
TRN6283A	"PL" MICROPHONE HANG-UP KIT				
TMN1008A	"PL" DESK MICROPHONE				
TMN1009A	CARRIER SQUELCH DESK MICROPHONE				
TMN1010A	"PL" DESK MICROPHONE				

EPS-17372-C

MOTOROLA

UNIFIED CHASSIS KITS

FOR

"MAXAR"
FM TWO-WAY RADIO
150.8-174 MHz
10 W & 25 W RF POWER
+12 V MOBILE
117 V AC BASE STATION

CODE:

X = ONE ITEM SUPPLIED

• REFER TO SAME MODEL NUMBER IN UNIFIED CHASSIS LISTING FOR LOWER LEVEL KITS.

| MODEL NUMBER | DESCRIPTION | KIT NUMBER | | |

RADIO SET ACCESSORY TABLE

KIT NUMBER	DESCRIPTION	
TMN6113A	HANDSET	
TRN6319A	HANDSET HANG-UP BOX	
TRN6320A	REVERSE ESCUTCHEON	1 FREQ., CARRIER SQUELCH RADIOS
TRN6321A		2 FREQ., CARRIER SQUELCH RADIOS
TRN6322A		1 FREQ., "PRIVATE-LINE" TONE-CODED SQUELCH RADIOS
TRN6323A		2 FREQ., "PRIVATE-LINE" TONE-CODED SQUELCH RADIOS
TRN6324A		1 FREQ., DIGITAL "PL" CODED SQUELCH RADIOS
TRN6325A		2 FREQ., DIGITAL "PL" CODED SQUELCH RADIOS
TSN6022A	EXTERNAL SPEAKER	
TRN6223A	BASE STATION MOUNTING TRAY WITHOUT MICROPHONE CLIP	
TRN6318A	BASE STATION MOUNTING TRAY WITH MICROPHONE CLIP	
TRN6524A	SECURITY MOUNTING HARDWARE	
TRN6525A	RADIO-TO-TRUNNION QUICK MOUNTING SCREWS	

EPS-17551-B

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, revision suffix numerals are added to the affected kit model number. For example, a TLN4448A becomes a TLN4448A-1 with the first revision, TLN4448A-2 with the second revision, etc.

As diagrams are updated, information about the change is incorporated into a revision column. This revision column appears in the manual next to the parts list or, in some cases, on the diagram. It lists the reference number, part number, and description of the parts removed or replaced when the suffix number changed. With this information, the technician can find the information for the current version, and any previous version, of the equipment covered by the manual.

3. SERVICE

Motorola's National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communication equipment users. This organization includes approximately 800 authorized Motorola Service Stations (MSS) located throughout the United States, each manned by one or more trained, FCC licensed technicians.

These MSS's are independently owned and operated and were selected by Motorola to service its customers. Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

The administrative staff of this organization consists of national, area and district service managers and district service representatives, all of whom are Motorola employees with the objective to improve the service to our customers.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola Service Representative, or write to:

National Service Manager
Motorola Communications Division
1301 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically-located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Division products.

Orders for all parts except crystals, channel elements, and "Vibrasender"® and "Vibrasponder"® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, code plugs, "Vibrasender" and "Vibrasponder" resonant reeds should specify type number and frequency, and should identify the owner/operator of the communications system in which these items are to be used.

68P81025E81-F

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA, INC.
Communications Division Parts Dept.
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60172
Phone: 312-397-1000
Executive Offices: 1301 E. Algonquin Rd.,
Schaumburg, Illinois 60172

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City,
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS
10 W. North Ave.,
Lombard, Ill. 60148
Phone: 312-620-3000
TWX: 910-693-1592

MID–ATLANTIC AREA PARTS
6701 Elkridge Landing Road,
Linthicum, Maryland 21090
Phone: 301-796-8600

EAST CENTRAL AREA PARTS
12995 Snow Road,
Parma, Ohio 44130
Phone: 216-267-2210
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road,
Glen Rock, New Jersey 07452
Phone: 201-447-4000
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS
2333 Utah Avenue,
El Segundo, California 90245
Phone: 213-644-1101
TWX: 910-348-6278

SOUTHWESTERN AREA PARTS
3320 Belt Line Road,
Dallas, Texas 75234
Phone: 214-241-2151
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
5096 Panola
Industrial Blvd.
Decatur, Georgia 30032
Phone: 404-981-9800
TWX: 810-751-8300

5.3 CANADIAN ORDERS

CANADIAN MOTOROLA ELECTRONICS COMPANY
Parts Department
3125 Steeles Avenue,
East Willowdale, Ontario
Phone: 516-499-1441
TWX: 610-492-2713
Telex: 02-29944LD

5.4 ALL COUNTERIES EXCEPT U.S. AND CANADA

MOTOROLA, INC. OR MOTOROLA AMERICAS, INC.
International Parts
1313 E. Algonquin Road
Schaumburg, Illinois 60172 U.S.A.
Phone: 312-397-1000
TWX: 910-693-1592 or 1599
Telex: 722443 or 722424
Cable: MOTOL

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS AND RESONANT REED ORDERS

AIR MAIL ORDERS
Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

REGULAR MAIL ORDERS AND CORRESPONDENCE
Motorola, Inc.
Component Products Sales & Service
2553 Edgington Street
Franklin Park, Illinois 60131

68P81025E81-F

OPERATOR'S INSTRUCTIONS

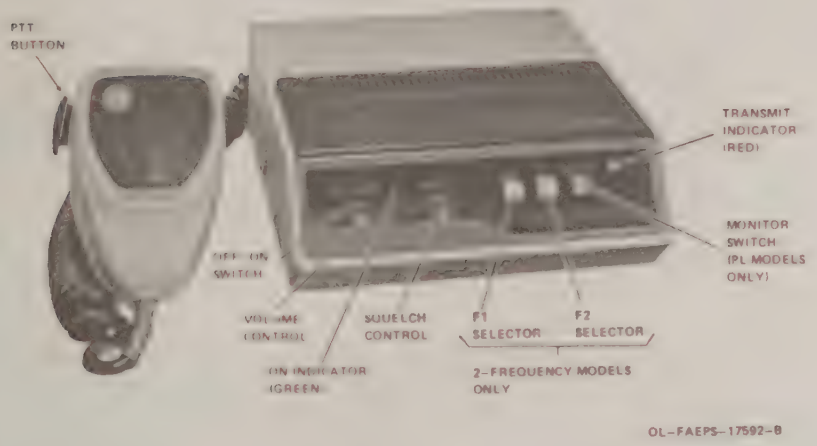


Figure 1.
Operating Controls and Indicators

1. TO TURN ON RADIO

The on-off switch for the radio set is operated by the OFF-VOLUME control. To turn on the radio set, rotate the OFF-VOLUME control knob clockwise until a click is heard. The front panel lamp then turns on to illuminate the control labels and the green ON indicator.

2. TO RECEIVE

OPERATION	PROCEDURE
1. Disable PL (PL models only)	Press MONITOR button so it stays in. -OR- Remove microphone from hang-up box.
2. Unsquelch radio.	Turn SQUELCH control counterclockwise until noise is heard.
3. Set VOLUME control	Adjust VOLUME control for a comfortable listening level.
4. Set SQUELCH control	Turn SQUELCH control clockwise until noise just stops.
5. Select operating frequency. (Two-frequency models only)	Press F1 or F2 button, as needed.
The radio is now adjusted to receive all messages on the selected frequency.	
6. Enable PL (PL models only)	Press MONITOR button and allow it to return to the "out" position. -AND- If radio uses a microphone hang-up box, insert microphone into its hanger.
You are now able to hear messages for your system only.	

3. TO TRANSMIT

OPERATION	PROCEDURE
1. Disable PL (PL models only)	Press MONITOR button so it stays in. -OR- Remove microphone from hang-up box.
2. Select operating frequency (Two-frequency models only)	Press F1 or F2 button, as needed.
3. LISTEN	DO NOT TRANSMIT if anyone is using the channel.
4. Key transmitter	Press and hold down microphone PTT button. Red light on radio front panel will glow indicating that the transmitter is "on-the-air".
5. Transmit message	Hold microphone about 2 inches from your lips and speak slowly into microphone at a normal voice level. Shouting will not make your message easier to understand. Make each transmission as brief as possible.
6. Receive reply	Release microphone PTT button.
7. Enable PL at end of conversation (PL models only)	Press MONITOR button and allow it to return to the "out" position. -AND- Insert microphone into its hanger.

PREINSTALLATION INSTRUCTIONS

1. UNPACKING

When unpacking the radio from its shipping carton, refer to the model chart at the front of this manual. If any item is missing, contact your Motorola representative immediately.

2. BENCH CHECK

2.1 INTRODUCTION

Your radio set was thoroughly tested and inspected before shipment. However, it is possible that some adjustments may have changed during shipment. FCC regulations require that transmitter preinstallation tests be performed. It is also wise to check receiver performance before the radio is placed into regular service.

2.2 TESTING

Test the radio with the microphone, cable and any other accessories that were shipped with it. FCC regulations require that transmitter power output, modulation deviation, and carrier frequency be checked before the radio is used. In addition, it is wise to check the receiver sensitivity, squelch operation, and audio quality. If the radio is a PL model, transmit and receive PL operation should be checked. Refer to the Specifications page at the front of this manual to determine if your radio is operating properly. Improper operation can generally be corrected by touching up the receiver or transmitter alignment.

3. INSTALLATION PLANNING - MOBILE RADIOS

3.1 GENERAL

Planning is the key to fast, easy radio installation. Before a hole is drilled or a wire is run, inspect the vehicle and determine how and where you intend to mount the antenna, radio set, and accessories. Plan wire and cable runs to provide maximum protection from pinching, crushing, and overheating.

3.2 ANTENNA MOUNTING

The best mounting location for the antenna is in the center of a large, flat conductive surface. In almost all vehicles these requirements are best satisfied by mounting the antenna at the center of the roof. Some vehicles have a large trunk lid that will provide a good antenna location. If the trunk lid is used, connect grounding straps between the trunk lid and vehicle chassis to insure that the trunk lid is at chassis ground.

3.3 RADIO MOUNTING

3.3.1 General

The trunnion mount allows the radio set to be mounted to a variety of mounting surfaces. Be sure the mounting surface is able to adequately support the weight of the radio. Allow sufficient space around the radio for free air flow for cooling. Be sure the unit is close enough to the vehicle operator to permit easy access to the operating controls while he is driving.

3.3.2 Inverted Escutcheon Installation

A front panel escutcheon with inverted lettering (Motorola Option B96) is available if you plan to mount the radio above the operator's normal line of sight. Install the inverted escutcheon as follows:

Step 1. Remove the radio chassis from its housing.

Step 2. Using a long screwdriver, push on the back of the upright escutcheon until it is free of the radio housing front panel.

Step 3. Remove the tape from the back of the inverted escutcheon. Press the inverted escutcheon onto the radio housing front panel.

Step 4. Pull the pushbuttons off the F1, F2, and PL switches. Invert the pushbuttons and replace them on the switches.

Step 5. Reinstall the radio chassis into the housing. Be sure the chassis locking tabs properly engage the slots in the housing.

3.4 DC POWER AND WIRING

3.4.1 This radio must be operated only in negative-ground electrical systems. Reverse polarity will not damage the radio, but the cable fuse will blow. Check the vehicle ground polarity before you begin installation to prevent wasted time and effort.

3.4.2 Connect the red power lead through F601 to the vehicle battery positive terminal. Connecting the red lead to any other positive voltage point in the vehicle is not recommended.

CAUTION

If dc power is to be controlled by the vehicle ignition switch, a switching relay (Motorola Part No. 59-813674) should be used to switch the red power lead. The vehicle ignition switch, then, controls dc to the relay coil.

3.4.3 Connect the black power lead to a good ground point on the vehicle chassis. Do not connect the black lead directly to the battery negative terminal.

3.4.4 The wiring provided with the radio is of sufficient size to handle the maximum radio current demand. If wiring must be added to that provided, be sure the gauge of the added wire is sufficient for the current to be carried and length of the added run.

4. INSTALLATION PLANNING - BASE STATIONS

4.1 ANTENNA SYSTEM

Selecting the antenna system for your base radio depends on factors beyond the scope of this manual. Your Motorola representative can help you choose the antenna system that will best serve your particular needs.

4.2 RADIO LOCATION

Choose a location for your base radio as close as possible to where the antenna cable enters the building. Be sure 117 volt, 60 Hz power is available. Make sure sufficient air can flow around the radio to permit adequate cooling.

INSTALLATION INSTRUCTIONS

1. MOBILE RADIOS

Step 1. Mount the antenna, using the instructions provided with the antenna kit. Run the coaxial cable to the intended radio set mounting location. Cut off the excess cable and install the cable connector.

Step 2. Route power wiring, but do not make power connections and do not tie the wires down. Be sure to use grommets wherever the wiring must pass through a metal panel.

Step 3. Mount the radio set trunnion mounting bracket. See Figure 2.

Step 4. Mount the microphone hanger or microphone hang-up box.

Step 5. Connect the power plug and coaxial cable connector to the radio set. See Figure 3. Install the radio in the trunnion mounting bracket.

Step 6. Complete the power wire installation. Be sure to leave sufficient slack wire behind the radio set to make the unit easy to remove and reinstall. Strap the wire down where necessary being sure the wires do not make contact with hot areas on the engine. Be sure the wires cannot be snagged by the operator's feet or during normal vehicle operation. Cut off the excess power lead length and attach the terminal lugs supplied.

Step 7. If a microphone hang-up box or external speaker is used, secure wiring to those items as needed. Allow sufficient slack in wiring for future maintenance.

Step 8. Connect the power leads. Be sure the connection points are clean and free of paint, dirt, and corrosion.

Step 9. Test radio and its accessories for proper system operation. Check the antenna SWR, using an in-line wattmeter.

CAUTION

After installation, remove the protective film from the escutcheon. To remove any dust accumulation from the escutcheon, always wipe with a damp cloth.

2. BASE STATIONS

Step 1. Mount the radio set to the base mounting tray.

Step 2. Prepare radio set power leads as follows: Attach the provided pins to the ends of the red and black power leads. Insert power leads into the mating plug of the base station power supply output jack; red lead pin into position 4 and the black lead pin into position 1.

Step 3. Connect an in-line wattmeter between the radio antenna connector and the antenna system.

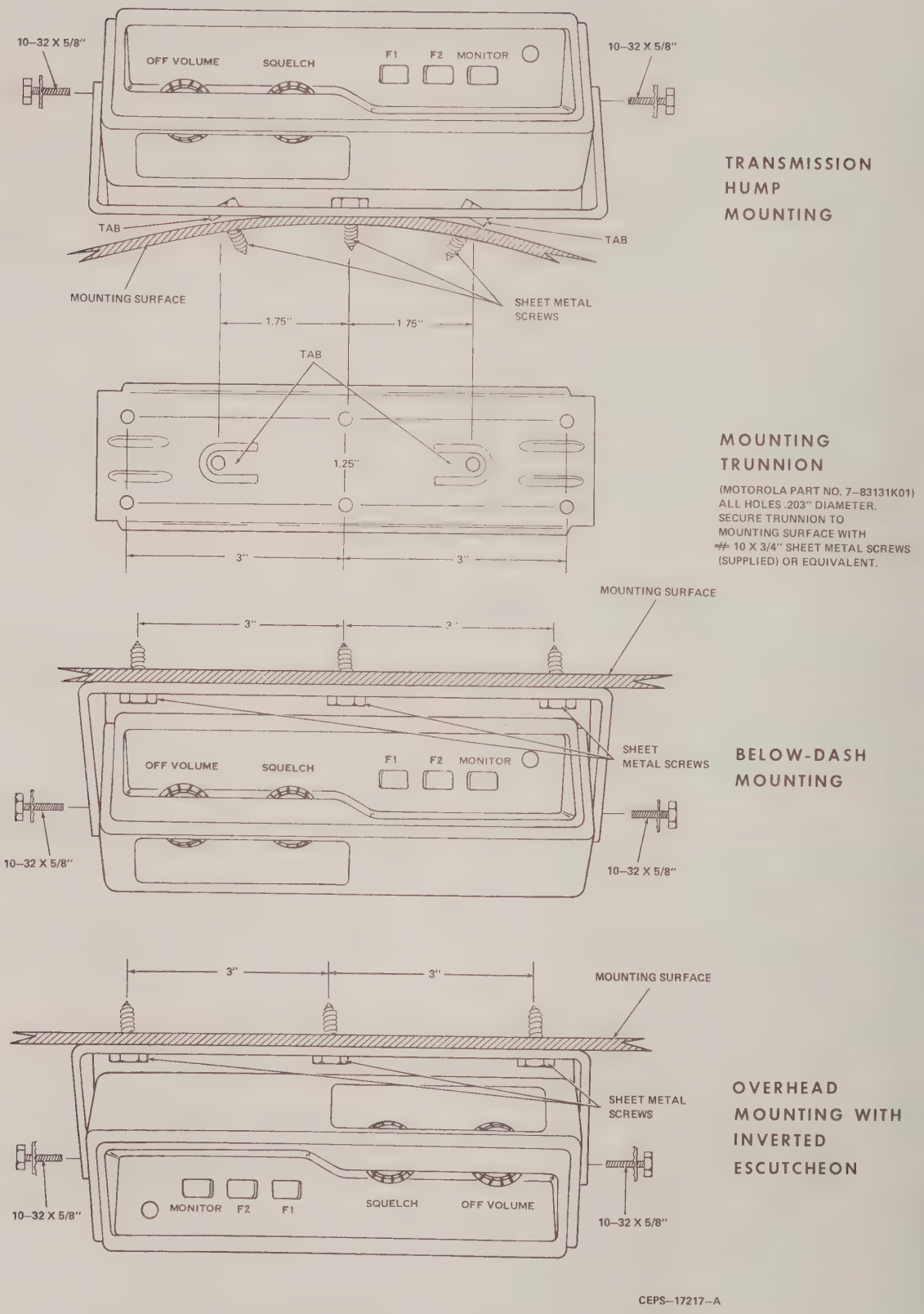


Figure 2. Radio Mounting Detail

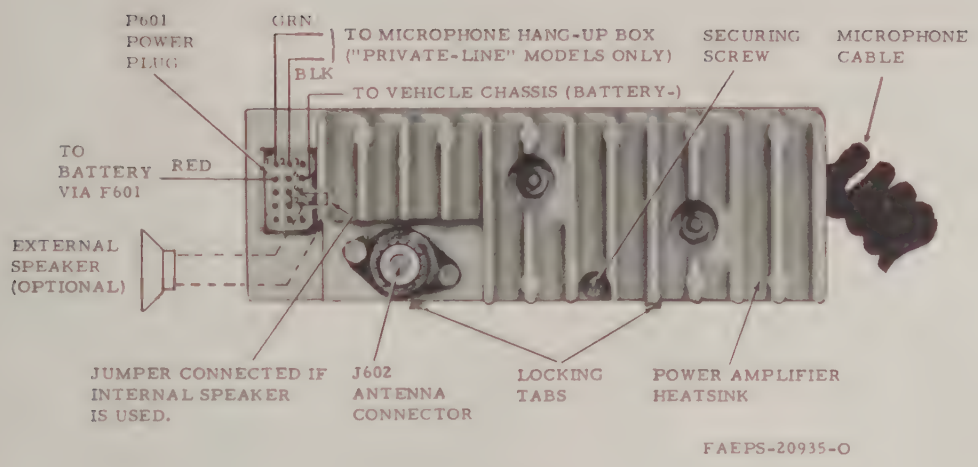


Figure 3.
Connections to Radio Set Rear Panel

Step 4. Plug the base dc power supply into the 117 volt, 60 Hz outlet. Set the AC POWER switch on the power supply to the ON position.

Step 5. Key the transmitter and check the antenna system VSWR. If the VSWR is 3:1 or lower, disconnect the wattmeter and connect the antenna coaxial cable to the radio set antenna jack.

Step 6. Test the radio set and accessories for proper operation. A brief conversation with a mobile unit in your system will indicate whether the base station is operating satisfactorily.

CAUTION

After installation, remove the protective film from the escutcheon. To remove any dust accumulation from the escutcheon, always wipe with a damp cloth.

SERVICE

1. INTRODUCTION

This radio is designed for easy servicing. All of the metering points are brought out to radio set power connector J601. For servicing information, refer to the schematic diagrams, circuit board details, and alignment procedures in this manual. Theory of operation is shown on the schematic diagrams.

2. HOUSING REMOVAL

(Refer to Figure 3)

Step 1. Remove the screws that hold the radio set in the trunnion mount.

Step 2. Insert a screwdriver blade into the screwdriver slot near the bottom of the radio chassis rear panel.

Step 3. Push the screwdriver against the housing until the chassis locking tabs clear the slots in the radio housing.

Step 4. Slide the radio chassis out the back of the housing.

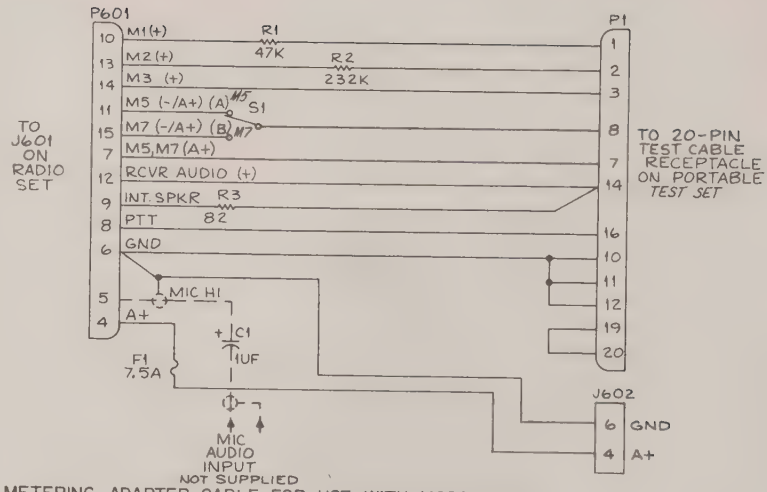
3. WIRE REPLACEMENT -- POWER PLUG P601

A special wire extraction tool (Motorola model number ST1145) is available to remove wires from power plug P601. The tool must be used for ease of wire extraction and to prevent damage to the connector or its pins.

HOW TO USE MODELS S1056A PORTABLE
TEST SET WITH SKN6030A METERING ADAPTER CABLE

METERING POINT	TEST SET METER SELECTOR SWITCH POSITION	RCVR–XMTR ACCESSORIES SWITCH POSITION	METER OFF–REV SWITCH POSITION	REMARKS
1	1	RCVR	REV	
2	2	RCVR	REV	
3	3	XMTR	REV	
5	7	XMTR	OFF	S1 IN POSITION M5 (A)
7	7	XMTR	OFF	S1 IN POSITION M7 (B)
RCVR AUDIO	11	RCVR	OFF	2 VAC OR 0.2 VAC METER RANGE

RADIO MUST BE KEYED WITH "XMTR ON" BUTTON ON TEST SET WHEN TEST CABLE IS CONNECTED.

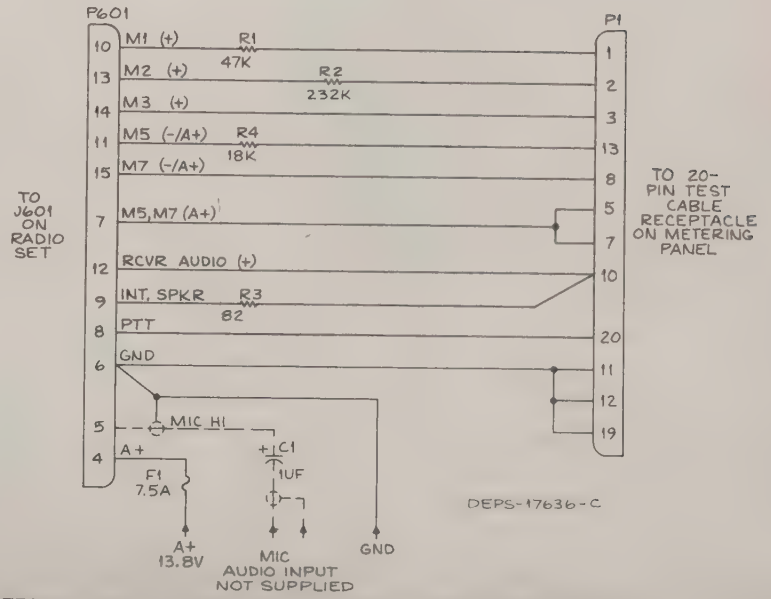


SKN6030A METERING ADAPTER CABLE FOR USE WITH MODEL S1056A PORTABLE TEST SET

SKN6029A and SKN6030A Metering Adapter Cable PL-4075-A

		CAPACITOR, fixed:
C1	23-82783B10	1 uF ±20%; 50 V (not supplied)
		FUSE, cartridge:
F1	65-86099	7.5 amp
		CONNECTOR, receptacle:
J602		includes:
	15-83292K01	SHELL, female; 2 contact
	29-84706E04	TERMINAL, 2 req'd.
		CONNECTOR, plug:
P1	9-855266	female; 20 contact
P601		includes:
	15-80315A39	INSULATOR, 15-circuit
	29-84706E03	TERMINAL, male; 12 req'd.
		RESISTOR, fixed: 1/4 W:
R1	6-124A89	47k ±5%
R2	6-10621E24	232k, 1%
R3	6-124C23	82 ±10%
R4	6-124A79	18k ±5%
		SWITCH:
S1	40-82148F01	spdt
		FUSEHOLDER:
XF1	14-82882A01	BODY, fuseholder
	14-82883A01	CAP, fuseholder
	42-82884A01	CLIP, fuseholder; 2 req'd.

Figure 4.
Metering Adapter Cable



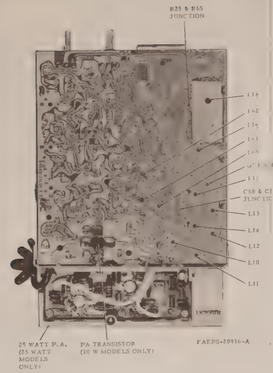
SKN6029A METERING ADAPTER CABLE FOR USE WITH MODEL TEK-5B OR C METERING PANEL, EQUIPPED WITH TEK-40 CONVERSION KIT OR TEK-5E METERING PANEL

HOW TO USE TEK-5 METERING PANEL WITH SKN6029A ADAPTER CABLE

1. SET TEK-5 SELECTOR SWITCH TO POSITION C.
2. SET TEK-5 XMIT–REC SWITCH TO REC POSITION FOR M1, M2, AND RCVR AUDIO. SET XMIT–REC SWITCH TO XMIT FOR M3, M5 AND M7.
3. DURING "IDC" ADJUSTMENT RADIO MUST BE KEYED WITH "KEY" BUTTON IF AUDIO IS APPLIED AT CABLE MIC AUDIO INPUT.

REQUIRED TEST EQUIPMENT FOR "MAXAR" RADIO SERVICING

GENERAL TYPE	APPLICATION	RECOMMENDED MODEL	MIN. SPECIFICATIONS
DC Voltmeter	DC voltage measurements, general	Motorola T1009A	Measurement range: 0-15 V dc Sensitivity: 20,000 ohms/volt
VTVM or DVM	DC voltage readings requiring a high input resistance meter.	Motorola S1063A	Measurement range: 0-15 V dc Input resistance: 11 megohms
AC Voltmeter	Audio voltage measurements	Motorola S1053C	Measurement range: 0-10 V ac Input resistance: 10 megohms
RF Voltmeter	RF voltage measurements	Motorola S1339A	Measurement range: 100 uV-3 V from 1 MHz - 200 MHz Inputs: 50 ohm and high impedance
Oscilloscope	Waveform observation	Telequipment Model D61	Vertical sensitivity: 10 mV-10 V/division Horizontal time base: 1 usec. -1 sec/division
RF Wattmeter	Transmitter output power measurement	Motorola Wattmeter with appropriate element and T1013A RF Dummy Load	Measurement ranges: 0-25 Watts (10 W) or 0-50 Watts (25 W) from 100-250 MHz
Frequency Meter	Transmitter frequency measurement	Motorola S-1327 Series, S-1343 Series, or S-1344 Series	Measurement range: 100-200 MHz Frequency resolution: 10 Hz
Deviation Meter	Transmitter modulation deviation measurement	Motorola S1323A or Motorola S1325A	Measurement range: 0-10 kHz deviation Frequency Range: 100-200 MHz
RF Signal Generator	Receiver alignment and troubleshooting	Motorola S1318A	Frequency Range: 130-175 MHz Output Level: 0.1 uV-100,000 uV Must be capable of at least ±3 kHz deviation when modulated by 1 kHz tone.
Audio Signal Generator	Audio circuit troubleshooting	Motorola S1067A	Frequency Range: 20 Hz - 20 kHz Output Level: 50 mV - 1 V
PL Tone Generator	"Private-Line" Decoder troubleshooting	Motorola SLN6221A	Frequency Range: 50 Hz - 200 Hz Output Level: 0-500 mV
DPL Test Set	"Digital Private-Line" Encoder-Decoder Troubleshooting	Motorola SLN6413A	
Radio Test Set w/appropriate metering cable (SKN6029A for TEK-5 and SKN6030A for Portable Test Set)	Meter readings at circuit metering points for alignment and troubleshooting	Motorola S1056B Portable Test Set, TEK5B or C Metering Panel with TEK40 Conversion Kit, or TEK5E Metering Panel. See Figure 4.	See Figure 4.



Receiver Adjustment Locations

RECEIVER METERING

TYPICAL RECEIVER METER READINGS WITH TEK-5 METERING PANEL OR S1056A PORTABLE TEST SET

METER	MEASUREMENT	READING, uA
1	2ND I-F AMPLIFIER SIGNAL LEVEL	8-14 (NO SIGNAL) 50 (40 uV INPUT)
2	QUADRATURE DETECTOR OUTPUT	24 ±1

RECEIVER METERING WITH 20,000 OHM/VOLT VOLTMETER

METERING POINT	VOLTMETER LEAD CONNECTIONS		VOLTMETER SCALE	TYPICAL READINGS
	+	-		
M1 2ND IF AMPL. SIGNAL LEVEL	J601-10	CHASSIS GROUND	2.5 V DC	.25-.5 V (NO SIGNAL) 1.75 V (40 uV INPUT)
M2 QUADRATURE DETECTOR OUTPUT	J601-13	CHASSIS GROUND	10 V DC	5.2 V ±.2 V

EPS-17214-B

RECEIVER

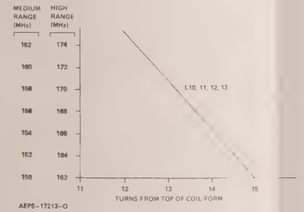
PREALIGNMENT NOTES

1. On "Digital Private-Line" and "Private-Line" radio sets disable the DPL or PL decoder by depressing the front panel MONITOR pushbutton.
2. In some cases, peak meter readings may occur at two points in the tuning range of a coil. Always choose point where the slug is nearest the top of the coil form (away from the circuit board).
3. Unnecessary tuning adjustments should be avoided. Usually, the receiver will require only a "touch-up" alignment. Complete receiver alignment is necessary in the following cases:
   a. After changing the receiver operating frequency.
   b. After replacing a component in a frequency-sensitive network.
4. Before beginning a complete receiver alignment, preset tuning adjustments as follows:
   a. Set L10, 11, 12 and 13 according to the graph shown below.
   b. Set L14, 15 and 16 slugs 7-1/2 turns from tops of coil forms.
   c. Set L18 slug 5 turns from top of coil form.
5. Receiver frequency calculations:

$$f_{osc} = \frac{f_c - 10.7\ MHz}{3} \quad \text{and} \quad f_{inj} = 3f_{osc} = f_c - 10.7\ MHz$$

Where f_c = carrier frequency, f_{osc} = oscillator crystal frequency, and f_{inj} = mixer injection frequency.

6. Two-frequency radios should be tuned on the lower operating frequency.



TEST EQUIPMENT SET-UP

1. If a TEK-5 Metering Panel or a S1056B Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown in Figure 4. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the voltmeter metering table on this page.
2. Connect a dc power supply to the power leads of the test cable. Set the power supply output to 13.8 volts.

RECEIVER ALIGNMENT PROCEDURE AND TEST EQUIPMENT LIST

RECEIVER ALIGNMENT

STEP	INPUT SIGNAL	SIGNAL INPUT POINT	ADJUST	METERING POINT	DESIRED READING
1 Quadrature detector	10.7 MHz @ 1 mV	Near Q3. Allow signal to "spray" into circuit.	L12	M2	24 ±1 mA -OR-
				VOM or VTVM at J601-13	5.8 V dc
2 IF Strip	10.7 MHz (Note 1)	Antenna Connector	L14, 15, 16	M1	Peak, then repeak.
3 Injection Oscillator Frequency	--	--	L61 (F1), then L62 (F2)	Frequency counter through .01 uF capacitor to C68-C69 junction.	3 x crystal frequency. Recheck both coil settings.
			OR		
	Carrier frequency	Antenna connector	L61 (F1) and L62 (F2)	Radio speaker	Signal levels to provide beat note, then L61 (and L62 in 2-freq. models) for zero beat. Recheck both coil settings.
	10.7 MHz	Loosely coupled to rf amplifier			
4 RF Amplifier and IF Strip	Carrier frequency (Notes 1 and 2)	Antenna Connector	L13, 12, 11, 10, 60 then L14, 15, 16	M1	Peak, then repeak.
5 Mixer Input and Injection Oscillator Output	Carrier frequency. Level set to where receiver begins to quiet.	Antenna Connector	L60, 14, 12, 11, 10	--	Best receiver quieting. Recheck injection oscillator frequency and readjust if necessary.

NOTES:
1. Reduce signal generator output as needed to keep M1 reading below 40 uA.
2. To set signal generator approximately on frequency without a frequency counter, open receiver squelch and adjust the signal generator frequency until receiver quiets. Carefully adjust signal generator frequency for a 24 uA M2 reading or for a 6.0 volt dc vtvm reading at junction of R25 & R65.

20 DB QUIETING SENSITIVITY MEASUREMENT

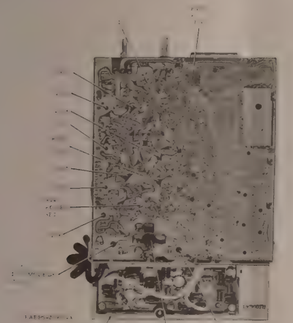
1. Connect an ac vtvm across the speaker.
2. On PL model radio sets, disable PL by depressing the MONITOR button on the radio set front panel.
3. Turn the SQUELCH control fully counterclockwise.
4. Turn on the radio set and adjust the VOLUME control until a reading of 2 volts is obtained on the ac vtvm.
5. Connect an rf signal generator to the radio set antenna connector. Set the signal generator to the carrier frequency, and set the generator output level control to minimum.
6. Slowly increase the output level of the rf signal generator until the ac vtvm reads 0.2 volts.
7. Note the signal generator output signal level. This signal level is the 20 dB quieting sensitivity of the receiver.

RECEIVER WIDE-SPACE TUNING

On two frequency radios, tune up radio at highest customer frequency. Switch to lowest frequency and balance 20 dB quieting by retuning L12.

Motorola No. PEPS-17224-F
6/1/76-NPC

TRANSMITTER ALIGNMENT PROCEDURE



Transmitter Adjustment Locations

TRANSMITTER METERING

TRANSMITTER METER READINGS USING TEK-5 METERING PANEL OR S1056B PORTABLE TEST SET

METER	MEASUREMENT	READING (uA)	REMARKS
3	BUFFER AMPLIFIER INPUT	8 (MIN)	
5	EXCITER OUTPUT AMPLIFIER COLLECTOR CURRENT	12 (TYP 18 (MAX)	
7	PA CURRENT	10 WATT MODELS 25 WATT MODELS	11 (TYP 16 (MAX 11 (TYP 16 (MAX	MULTIPLY M7 X 14 TO OBTAIN PA FINAL CURRENT IN AMPS MULTIPLY M7 X 25 TO OBTAIN PA FINAL CURRENT IN AMPS

VOLT METER BETWEEN METER 7 POINT & CHASSIS GROUND	PA VOLTAGE	
	PA INPUT POWER	MULTIPLY PA VOLTAGE BY PA CURRENT

TRANSMITTER METER READINGS USING 20,000 OHM/VOLT VOLTMETER

METERING FUNCTION	VOLTMETER LEAD CONNECTIONS		VOLTMETER SCALE	TYPICAL READINGS
M3 BUFFER AMPL INPUT	J601-14	CHASSIS GROUND	50 uA, DC	8 uA (MIN)
M5 EXCITER OUTPUT AMPLIFIER COLLECTOR CURRENT	J601-7	J601-11	1 mA, DC	17 mA (TYP.) 22 mA (MAX)
M7 PA CURRENT	J601-7	J601-15	500 mA, DC	175 mA (TYP.) 250 mA (MAX)

EPS-17215-B

PEPS-17225-F
(Sheet 1 of 2)
6/11/76-2-PC

TRANSMITTER

PREALIGNMENT NOTES

1. In some cases, peak readings may occur at two points in the tuning range of a coil. Always choose point where slug is nearest top of coil form (away from circuit board).

2. Unnecessary tuning adjustments should be avoided. Usually, only a "touch-up" transmitter alignment is needed. Complete transmitter alignment is needed in the following cases:

   a. After changing transmitter operating frequency.

   b. After replacing a component in a frequency-sensitive network.

3. Before beginning a complete alignment, preset tuning adjustments as follows:

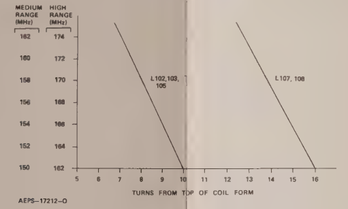
   a. Set C139, and C250 and C254 (in 10-watt models) or C210 (in 25-watt models) 1/4 turn counterclockwise from tight.

   b. Set L101 (and L114 in 2-frequency models) 7 turns from top of coil form (away from circuit board).

CAUTION

Low or no meter 3 reading will be obtained if L101 and L114 are not properly preset.

   c. Set L102, L103, L105, L107, and L108 according to the following chart:



   d. Set power set control R140 fully counterclockwise (viewed from solder side of board) for maximum xmtr power output.

4. Key transmitter for each step in alignment procedure and de-key after alignment step is completed. Avoid keying an unaligned transmitter for prolonged periods.

5. Two-frequency radios should be aligned on lowest operating frequency.

6. Transmitter frequency calculations:

$f_c = 9f_{osc}$, where f_c = carrier frequency, and f_{osc} = crystal oscillator frequency.

TEST EQUIPMENT SET-UP

1. If a TEK-5 Metering Panel or a S1056A Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown in Figure 4. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the metering tables on this page.
2. Connect an rf wattmeter, terminated in a resonant antenna or 50-ohm resistive dummy load, to radio set antenna connector J602.
3. Connect a dc power supply to the power leads of the test cable. Set the power supply output to 13.8 volts.

TWO-FREQUENCY RADIOS SHOULD BE TUNED ON LOWEST FREQUENCY.

EXCITER ALIGNMENT

STEP	ADJUST	METERING POINT	DESIRED READING
1 Oscillator Output	L102, then L103	M3	Peak
2 Buffer Output	L105	M3	Dip if no M5 reading.
		M5	Peak
3 Tripler Output	L107, then L108	M5	Peak
4 Exciter Output	C139	M7	Peak

10-WATT POWER AMPLIFIER ALIGNMENT

STEP	ADJUST	METERING POINT	DESIRED READING
1 PA Input	C250	RF Output	Peak wattmeter reading
2 PA Output	C254	RF Output	Peak wattmeter reading
3 Tripler	Repeak L107, then L108	RF Output or M5	Peak wattmeter reading or peak M5 reading
4 PA Output	C139, then C250, then C254	RF Output	Peak wattmeter reading
5 Drive Regulator	R140 Power Set	RF Output and M7	12 watts, with M7 less than 16 uA (SEE NOTE)

25-WATT POWER AMPLIFIER ALIGNMENT

STEP	ADJUST	METERING POINT	DESIRED READING
1 PA Output	C210	RF Output	Peak wattmeter reading
2 Exciter Output	C139	RF Output	Peak wattmeter reading
3 Tripler	Repeak L107, then L108	RF Output or M5	Peak wattmeter reading or peak M5 reading
4 PA Output	C139, then C210	RF Output	Peak wattmeter reading
5 Drive Regulator	R140, Power Set	RF Output and M7	28 watts, with M7 less than 16 uA. (SEE NOTE)

WIDE SPACE TUNE UP PROCEDURE

On two-frequency radios with the total channel separation in excess of 300 kHz but not exceeding 2 MHz, tune-up exciter and power amplifier on the lowest frequency as described above. Leave POWER SET R140 set for maximum power out.

STEP	ADJUST	METERING POINT	DESIRED READING
1 Oscillator	L102	M3	Alternately switch between the lowest and the highest transmit frequencies and adjust L102 for equal reading on meter 3.
2 Tripler	L107	RF Output	Alternately switch between the lowest and the highest transmit frequencies and adjust L107 for equal power out.
3 Power Set	R140	RF Output and M5	Set R140 on the lowest frequency for 12-watt output on 10-watt models and 28-watt output on 25-watt models. Check that meter 5 reading is at least 1 uA less than the maximum meter 5 reading when R140 was fully counter-clockwise. With channel separations in excess of 1.2 MHz but not exceeding 2 MHz, power out is 6 watts on 10-watt models and 15 watts on 25-watt models.
4 Oscillator Output	L102	M3	Repeat step 1
5 Oscillator Output	L102	M3	After oscillators are set on frequency, re-check M3 balance (step 1).

NOTE

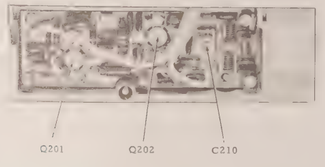
If the maximum power output obtainable is less than 12 watts on 10-watt radios or 28 watts on 25-watt radios, go back to step 2 of the exciter alignment procedure and repeat the alignment a second time. If the maximum obtainable power output is still below 12 or 28 watts, proceed as follows:

IF MAXIMUM IS BETWEEN 12 AND 11 WATTS OR BETWEEN 28 AND 26 WATTS:

Set R140 for 1 uA less than max obtainable reading on Meter 5. This ensures that the drive regulator circuit is in operation.

IF MAXIMUM IS LESS THAN 11 WATTS OR 26 WATTS:

The transmitter may be malfunctioning. Refer to the transmitter schematic diagram for troubleshooting information.



25-Watt PA Adjustment Locations

OSCILLATOR FREQUENCY ADJUSTMENT

Oscillators should be set on frequency AFTER transmitter has been aligned and BEFORE modulation deviation is set.

SET-UP:
1. Set up the frequency meter or counter controls as required.
2. In "Private-Line" (PL) radios, remove the "Vibrasponder" resonant reed from its socket on the PL board.

   In "Digital Private-Line" (DPL) radios, disable the DPL encoder by shorting together the "code disable" plating pads on the DPL board.

FREQUENCY ADJUSTMENT PROCEDURE:

STEP	PROCEDURE
1	Select F1
2	Key transmitter with no modulation
3	Adjust L101 for F1 frequency ±100 Hz
	Two-Frequency Models Only
4	Select F2
5	Adjust L114 for F2 frequency ±100 Hz

IDC ADJUSTMENT

Oscillator frequency adjustment must be made BEFORE setting the IDC controls.

SET-UP:
1. Set the deviation meter operating controls as needed.
2. In PL radios, remove the "Vibrasponder" resonant reed from its socket on the PL board.

   In DPL radios, disable the DPL encoder by shorting together the "code disable" plating pads on the DPL board.

IDC ADJUSTMENT (CONT'D)

3. Connect the output of an audio signal generator to J601 as follows:

   High side through a 1 uF capacitor (+ end toward the radio) to J601-5.
   Low side to J601-6 or radio chassis.

NOTE

The transmitter must be keyed by pressing the KEY button on the test set or by shorting J601-8 to J601-6 or the radio chassis. DO NOT USE THE MICROPHONE PTT SWITCH TO KEY THE TRANSMITTER DURING IDC ADJUSTMENT.

4. Connect an ac VTVM across the audio signal generator output.

IDC ADJUSTMENT PROCEDURE:

STEP	PROCEDURE
1	Set audio signal generator output frequency to 1000 Hz and output level to 0.8 V.
2	Select F1 and key transmitter. Adjust F1 "IDC" control R115 for ±5 kHz deviation meter reading.
3	On 2-freq. models, select F2 and key transmitter. Adjust F2 "IDC" control R131 for ±5 kHz deviation meter reading.
4	Reduce audio signal generator output level until deviation meter reads ±3.0 kHz. Audio oscillator output level should be 165 mV ±3 dB.
	"PRIVATE-LINE" MODELS ONLY
5	Insert resonant reed into socket on PL board and disconnect audio oscillator from J601.
6	Key transmitter and adjust Tone Level control R433 for PL tone deviation reading of 800 Hz.
7	Reconnect audio signal generator to J601-5 and -6 and repeat steps 1 through 3. Be sure overall deviation does not exceed ±5 kHz, including PL tone.
	or
	"DIGITAL PRIVATE-LINE" MODELS ONLY (SEE NOTE)
5	Remove the short from between the "code disable" plating pads on the DPL board and disconnect the audio signal generator from J601.
6	Key the transmitter and adjust Code Level set control R342 for a DPL code deviation reading of 750 Hz.
7	Reconnect the audio signal generator to J601-5 and -6. Repeat steps 5 and 6. Be sure overall deviation does not exceed ±5 kHz, including DPL code.

NOTE

To obtain accurate measurement of transmitter deviation in radios equipped with "Digital Private-Line" binary-coded squelch, the frequency response of the deviation measuring equipment must be < 1 Hz. If a deviation meter with this low frequency response characteristic is not available, the transmitter deviation can be checked by making the transmitter send continuous turn-off code during the measurement. Since the turn-off code waveform is sinusoidal, standard test equipment will then provide an accurate deviation measurement. To make the transmitter send continuous turn-off code, short together the base and emitter plating of PTT inverter Q309 and key the transmitter.

REFERENCE SYMBOL	PART NO.	DESCRIPTION

PARTS LIST

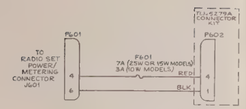
TLN5274A Regulator Board PL-2357-B

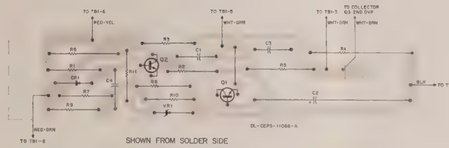
C1	6-[illegible]	CAPACITOR, fixed: MF; .047 ±[illegible]% V
C2	2[illegible]	[illegible]
C3, 4	8-[illegible]	.01[illegible]
CR1	48-[illegible]	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon
Q1, 2	48-[illegible]	TRANSISTOR: (SEE NOTE) NPN; type M9170
R1	6-[illegible]	RESISTOR, fixed: 5%, 1/2 W, unless otherwise stated 47 Ω
R2	6-[illegible]	1.5k
R3	6-[illegible]	33
R4	1[illegible]	200 ± [illegible]
R5, 6	6-[illegible]	470 Ω ±5%, 1 W
R7, 8	6-[illegible]	1k
R9, 10	6-6320	10Ω ±10% (NOTE: Use is optional; determined at factory)
R11	6-6393	1.2k ±10%
VR1	48-[illegible]	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon; Zener type; 6.8 V ±5%

TRN6282A Power Supply Chassis PL-3349-B

C1	23-82464C08	CAPACITOR, fixed: 11,000 uF +75-10%, 35 V
CR1, 2	48-82732C07	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon
CR3, 4	48-82732C10	silicon
J1		CONNECTOR, receptacle: includes: 15-10183A52 INSULATOR, 6-contact 29-82335A01 CONTACT, male; 4 req'd. (P/O Model TLN5219A)
F1	65-804908	FUSE, cartridge: slow-blow type; 2 A
P1	30-83212F01	LINE CORD: includes: ac plug
Q3	48-869677	TRANSISTOR: (SEE NOTE) PNP; type M9677
Q4, 5	48-869244	NPN; type M9244
S1	40-84622B02	SWITCH, slide: DPST
T1	25-83594E02	TRANSFORMER, power: prl: res 2.75 Ohms sec: res 0.11 Ohm
TB1	31-121700	TERMINAL STRIP: 8 terminals; No. 2 & 7 mtg.
XF1	9-82083C01	FUSEHOLDER: extractor post type
NON-REFERENCED ITEMS		
	26-84923B03	HEATSINK
	1-80745B88	HOUSING, power supply

NOTE: Replacement diodes and transistors must be ordered by listed part number only for optimum performance.





SHOWN FROM SOLDER SIDE

MODEL TABLE

MODEL	SUB-MODEL	SUFFIX	DESCRIPTION
TPN1136A	TLN5274A		REGULATOR BOARD
	TRN6282A		POWER SUPPLY CHASSIS
	TLN5279A		CONNECTOR KIT

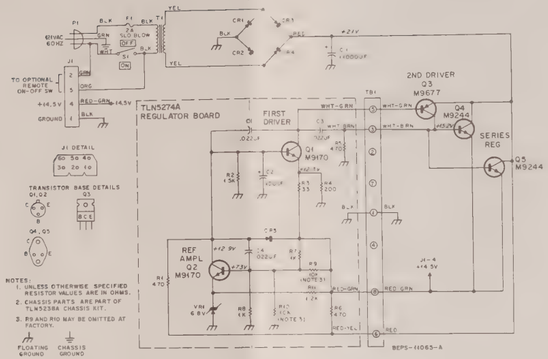
EPS-17211-B

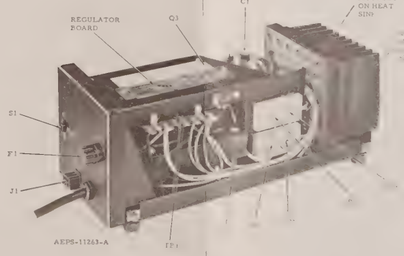
BASE STATION POWER SUPPLY

MODEL TPN1136A

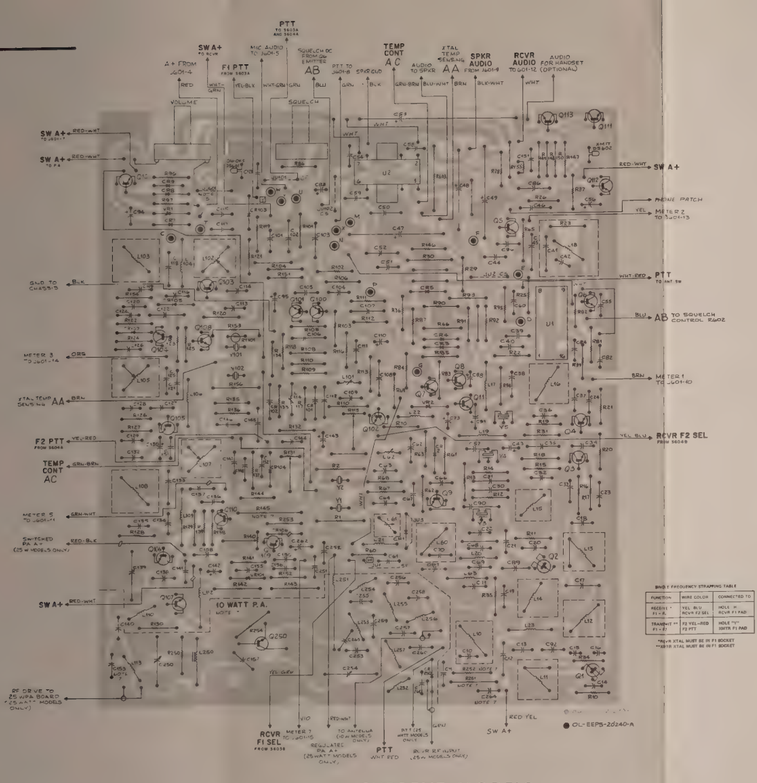
FUNCTION --

Provides the entire radio with regulated +14.5 V DC when used in a 120 V AC primary power fixed installation.





UNIFIED CHASSIS
CIRCUIT BOARD DETAIL



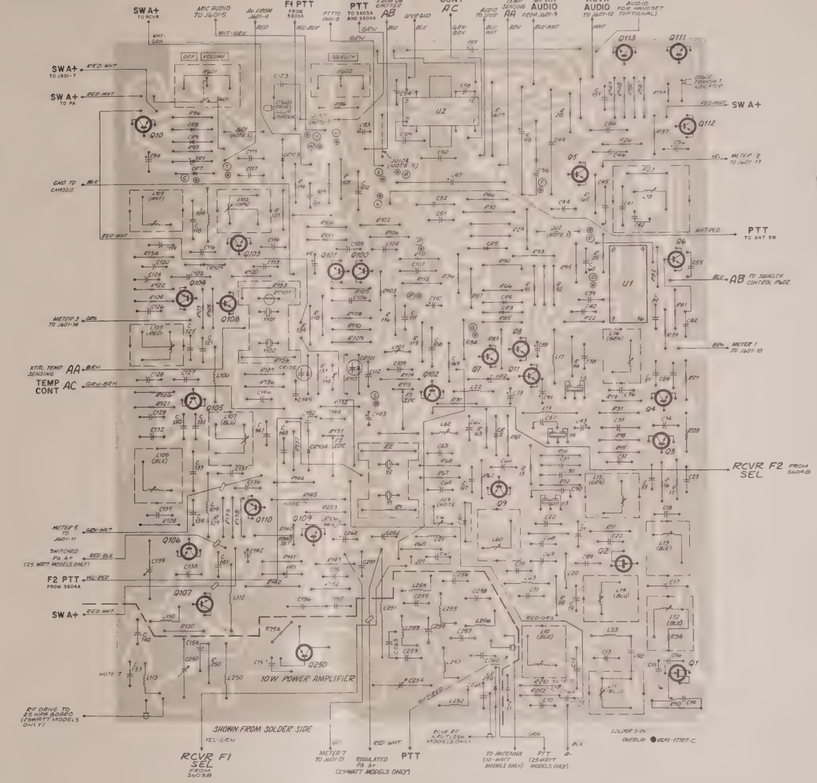
BAND 1 FREQUENCY STRAPPING TABLE

FUNCTION	WIRE COLOR	CONNECTED TO
RECEIVE * F1 P.A.	YEL BLU RCVR F2 SEL	HOLE "A" RCVR F1 PAD
TRANSMIT ** F1 P.A.	F2 YEL-RED TX PTT	HOLE "B" XMTR F1 PAD

*PLUG XTAL MUST BE IN F1 SOCKET
**2810 XTAL MUST BE IN F1 SOCKET

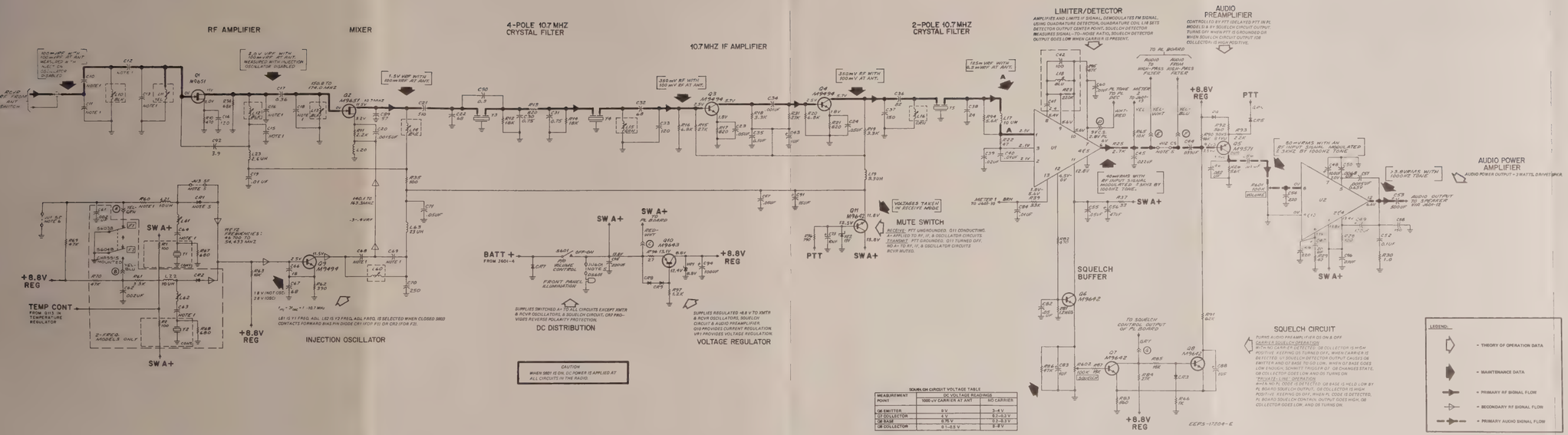
CRPS1031E37-O
(Sheet 1 of 4)
4/13/76-NPC

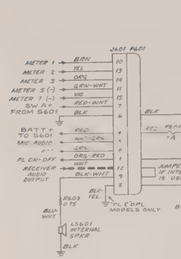
CURRENT MODELS



UNIFIED CHASSIS RECEIVER SECTION

FUNCTION:
Amplifies, mixes, filters, and demodulates received rf energy from antenna (via antenna switch) and provides an amplified audio signal to the speaker.





SCHEMATIC AND CIRCUIT BOARD NOTES:

1. REFER TO PARTS LIST FOR COMPONENT VALUE.
2. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS, AND CAPACITOR VALUES ARE IN PICOFARADS
3. VOLTAGE NOTATIONS ARE AS FOLLOWS
   T = TRANSMITTER KEYED
   R = RECEIVE (TRANSMITTER UNKEYED)
   U = RECEIVER UNSQUELCHED
   S = RECEIVER FULLY SQUELCHED
4. UNLESS OTHERWISE NOTED, DC VOLTAGES ARE MEASURED WITH A 20,000 OHM PER-VOLT METER, AND RF VOLTAGES ARE MEASURED WITH AN RF VOLTMETER
5. REFER TO THE JUMPER TABLE FOR JUMPER CONNECTIONS USED IN VARIOUS RADIO MODELS. SF = SINGLE FREQUENCY JUMPER. CS = CARRIER SQUELCH JUMPER.
6. U2 VOLTAGES MEASURED WITH VOLUME CONTROL FULLY COUNTERCLOCKWISE (MINIMUM VOLUME)
7. THE COMPONENTS ENCLOSED IN THE HEAVY DASHED OUTLINE PLUS R251, R252, AND R253 FORM THE 15-WATT POWER AMPLIFIER. IN THE 15 W PARTS LIST ALL THE PARTS EXCEPT THOSE INDICATED WITH * ARE OMITTED FOR 25-WATT MODELS. IN ADDITION C140, C153, C154, C157, C280, L61, L113, AND R146 CHANGE VALUE OR ARE OMITTED IN 25-WATT MODELS AS SHOWN IN PARTS LIST. THE 25 WATT P.A. MOUNTS ON A SEPARATE CIRCUIT BOARD AND IS SHOWN ON ITS OWN PAGE IN THIS MANUAL.

NEPS-17209-C

SQUELCH CIRCUIT VOLTAGE TABLE

MEASUREMENT POINT	DC VOLTAGE READINGS: 1000 uV CARRIER AT ANT.	NO CARRIER
Q6 EMITTER	0 V	3-4 V
Q7 COLLECTOR	4 V	0.7-0.3 V
Q8 BASE	0.75 V	0.7-0.3 V
Q8 COLLECTOR	0.1-0.5 V	8-8 V

RADIO SET PARTS LISTS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		PL-3350-C
		CASE:
		LAMP: type 12x71, 14 v
		FUSE:
		3 A, 250 V, 10-watt models
		7 A, 12 V, 25-watt models
		CONNECTOR, receptacle:
		7-pin, 51-52020-07 SHELL; 79-447-6284 TERMINALS, male
		RESISTORS, as listed, 1/2 rotation low loss
		SWITCH ASSEMBLY:
		6 POLE, 2-pos:
		3-pole, 2-pos:
		2-pole, 2-pos:
		1-pole, 2-pos:
		3-pole, 3-pos:
		2-pole, 3-pos:
		1-pole, 3-pos:
		1-pole, 4-pos:
		1-pole, 5-pos:
		1-pole, 6-pos:
		1-pole, 12-pos:
		1-pole, 25-pos:
		PL-3350-F
		CAPACITOR, fixed: pF ±5%; 500 V, unless otherwise stated
		RESISTOR, fixed: ±10%; 1/4 W, unless otherwise stated
		10 ohm
		100 ±5%, 1/2 W
		470
		1,000
		2,200
		4,700
		10,000
		22,000
		47,000
		100,000
		220,000
		470,000
		1 megohm
		2.2 megohm
		4.7 megohm
		10 megohm
		1 ±10%, 1/2 W
		2.2 ±5%
		4.7 ±5%
		10 ±5%
		22 ±5%
		47 ±5%
		100 ±5%
		220 ±5%
		470 ±5%
		1,000 ±5%
		2,200 ±5%
		4,700 ±5%
		10,000 ±5%
		22,000 ±5%
		47,000 ±5%
		100,000 ±5%
		220,000 ±5%
		470,000 ±5%
		1 megohm ±5%
		2.2 megohm ±5%
		4.7 megohm ±5%
		10 megohm ±5%
		RESISTOR, wirewound: 5 W, ±5%
		10 ohm
		22 ohm
		47 ohm
		100 ohm
		220 ohm
		470 ohm
		1,000 ohm
		2,200 ohm
		4,700 ohm
		10,000 ohm
		CRYSTAL, see PL-3350-E
		CRYSTAL, see PL-3350-F
		NON-REFERENCED ITEMS
		SOCKET, for 28-v lamp
		SOCKET, lamp for 28-v
		SWITCH, push, SPST
		BRACKET, mtg
		HOUSING
		NAMEPLATE
		NAMEPLATE, FCC
		KNOB, Control

**PL-3031E17-0
Printed 4-13-7?-NPC

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		PARTS LIST
		UNIFIED CHASSIS
		PL-3350-C
		CASE:
		LAMP: type 12x71, 14 v
		FUSE:
		3 A, 250 V, 10-watt models
		7 A, 12 V, 25-watt models
		CONNECTOR, receptacle:
		7-pin, 51-52020-07 SHELL; 79-447-6284 TERMINALS, male
		RESISTORS, as listed, 1/2 rotation low loss
		SWITCH ASSEMBLY:
		6 POLE, 2-pos:
		3-pole, 2-pos:
		2-pole, 2-pos:
		1-pole, 2-pos:
		3-pole, 3-pos:
		2-pole, 3-pos:
		1-pole, 3-pos:
		1-pole, 4-pos:
		1-pole, 5-pos:
		1-pole, 6-pos:
		1-pole, 12-pos:
		1-pole, 25-pos:
		PL-3350-F
		CAPACITOR, fixed: pF ±5%; 500 V, unless otherwise stated
		RESISTOR, fixed: ±10%; 1/4 W, unless otherwise stated
		10 ohm
		100 ±5%, 1/2 W
		470
		1,000
		2,200
		4,700
		10,000
		22,000
		47,000
		100,000
		220,000
		470,000
		1 megohm
		2.2 megohm
		4.7 megohm
		10 megohm
		1 ±10%, 1/2 W
		2.2 ±5%
		4.7 ±5%
		10 ±5%
		22 ±5%
		47 ±5%
		100 ±5%
		220 ±5%
		470 ±5%
		1,000 ±5%
		2,200 ±5%
		4,700 ±5%
		10,000 ±5%
		22,000 ±5%
		47,000 ±5%
		100,000 ±5%
		220,000 ±5%
		470,000 ±5%
		1 megohm ±5%
		2.2 megohm ±5%
		4.7 megohm ±5%
		10 megohm ±5%
		RESISTOR, wirewound: 5 W, ±5%
		10 ohm
		22 ohm
		47 ohm
		100 ohm
		220 ohm
		470 ohm
		1,000 ohm
		2,200 ohm
		4,700 ohm
		10,000 ohm
		CRYSTAL, see PL-3350-E
		CRYSTAL, see PL-3350-F
		NON-REFERENCED ITEMS
		SOCKET, for 28-v lamp
		SOCKET, lamp for 28-v
		SWITCH, push, SPST
		BRACKET, mtg
		HOUSING
		NAMEPLATE
		NAMEPLATE, FCC
		KNOB, Control

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L21, 22	24-84723H07	10 uH, (2 freq. only)
L23	24-8281XG08	, bake, 2, 6 uH
L20	24-84873A14	4-1/2 turns, coded RED
L61	24-8361OK01	18-1/2 turns, coded WHT (25 W only)
	or 24-84922C09	21-1/2 turns (10 watt only)
L62	24-8361OK01	18-1/2 turns, coded WHT (2-freq. only)
L63	24-84723H03	, bake, 2½ uH
Q1, 2	48-869651	TRANSISTOR: (SEE NOTE I) field-effect, type M9651
Q3, 4, 5	48-869494	NPN, type M9494
Q6, 7, 8, 11	48-869652	NPN, type M9652
Q9	48-869671	PNP, type M9671
Q10	48-869643	PNP, type M9643
R1, 2	64-32XA25	RESISTOR, fixed: ±10%; 1/4 W, unless otherwise stated
R10, 62	64-32AC47	100 ±5%, 1/2 W
R11, 93	64-32AC68	470
R12, 14	64-32AC79	1,000
R13, 17, 21	64-32AC87	2,200
R15, 16	64-32AC83	4,700
R18, 19	64-32AC61	10,000
R22	64-32AB47	22,000
R23	64-32AD06	47,000
R25	64-32AC99	100,000
R26	64-32AC75	220,000
R24, 35	64-32AC25	470,000
R29	64-32AD77	1 megohm
R40	64-32AD70	2.2 megohm
R94	64-32AA93	4.7 megohm
R95	64-32AA93	10 megohm
R17	64-32AC73	1 ±10%, 1/2 W
R33	64-32AC95	2.2 ±5%
R10	64-32AC61	4.7 ±5% (2-freq. only)
R11	64-32AC67	10 ±5% (2-freq. only)
R41	64-32AC63	4.7Ω ±5% (2-freq. only)
R42	64-32AC69	10 ±5%
R43	64-32AC73	22 ±5%
R44	64-32AC77	47 ±5%
R45	64-32AC81	100 ±5%
R46	64-32AC85	220 ±5%
R47	64-32AC89	470 ±5%
R48	64-32AC93	1,000 ±5%
R49, 70	64-32AC97	2,200 ±5%
R91	64-32AD24	4,700 ±5%
R92	64-32AD28	10,000 ±5%
R84	64-32AC49	22,000 ±5%
R85	64-32AC53	47,000 ±5%
R86	64-32AC57	100,000 ±5%
R87	64-32AC61	220,000 ±5%
R88	64-32AC65	470,000 ±5%
R89, 90	64-32AC69	1 megohm ±5%
R50	64-32AA89	2.2 megohm ±5%
R51	64-32AA93	4.7 megohm ±5%
R52	64-32AA97	10 megohm ±5%
R53	64-32AB01	RESISTOR, wirewound: 5 W, ±5%
R54	64-32AB05	10 ohm
R55	64-32AB09	22 ohm
R56	64-32AB13	47 ohm
R96	64-32AB17	100 ohm
R97	64-32AC91	220 ohm
		470 ohm
		1,000 ohm
		2,200 ohm
		4,700 ohm
		10,000 ohm
		CRYSTAL, see PL-3350-E
		CRYSTAL, see PL-3350-F
		NON-REFERENCED ITEMS
		SOCKET, for 28-v lamp
		SOCKET, lamp for 28-v
		SWITCH, push, SPST
		BRACKET, mtg
		HOUSING
		NAMEPLATE
		NAMEPLATE, FCC
		KNOB, Control

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		Factory-P/O Unified Chassis PL-3352-E
C101, 104, 105, 121-123, 132, 141, 150, 152, 155	21-8359XE10	CAPACITOR, fixed: pF ±5%; 500 V, unless otherwise stated 220 ±20%
C102, 103	8-8290SC08	.033 uF ±10%, 50 V
C106	8-8290SC10	.015 uF ±10%, 50 V
C107	21-8242BB15	.005 uF
C108	8-8290SC21	.010 uF ±10%, 100 V
C109	21-8218TB18	.0015 uF ±10%
C110	21-8466SF04	4 uF +150-0%, 65 V
C111	21-8505J0	470 ±10%, 300 V
C112	21-8224BB51	62; N220
C112M	21-8261OC21	51
C114	21-8449BB15	100
C115, 116, 124, 125, 126	21-8242BB59	.01 uF +80-20%, 200 V
C117M	21-82133G39	36; N150
C117N	21-82133G75	30; N150
C119, 133	21-8245DB25	.51
C119A	21-8449BB14	1
C119H	21-82133G39	36
C120	21-803147	150
C121	21-8218TB20	.001 uF ±10%, 100 V
C122	21-8245BB10	4.3
C127M	21-8261OC03	47
C127H	21-8340SD47	43
C128M	21-8631147	330
C128H	21-8261OC44	100; 100 V
C129	21-8449BB04	15 uF
C131M	21-82133G22	8 a. 5 pF; N150
C131H	21-82133G26	8 a. 5 pF; N90
C134M	21-82133G21	10 a. 5 pF; NP0
C134H	21-82133G22	6 a. 5 pF; NP0
C135	21-8224BB06	4.7 a. 25 pF; NP0
C136	21-8220SB06	100 ±0%; N1500
C137, 151, 156, 157	21-8237DC04	.05 uF +80-20%, 25 V
C138M	21-83400D69	30
C138H	21-83406U81	20
C139	21-83201B02	var; 8-60 pF
C140	21-8449AB32	20 (10-watt models)
	or 21-83550J10	220 (25-watt models)
C142	21-8465SF01	10 uF +100-0%, 35 V
C143	21-8466SF04	1 uF +150-0%, 35 V
C144	21-8505J0	470 ±10%, 300 V
C145M	21-8220SB51	62; N330
C145H	21-8261OC21	51; N220
C146	21-8449BB15	100
C147	21-8449AB15	100
C148	21-8242BB55	.01 uF +80-20%, 200 V
C153M	21-83406D70	8 a. 25 pF; NP0 (used in 10-watt models only)
C153H	21-820 2BD84	2 mica (25-watt models only)
C154	21-8449AB04	13 (25-watt models only)
C160	21-841946	5(25-watt models only)
CR101	48-82190H13	DIODE: (SEE NOTE) varactor
CR102	48-82190H13	varactor; (2-freq. only)
CR103, 106, 107	48-83654H01	silicon
CR104	48-83654H01	silicon; (2-freq. only)
CR105	48-82139G01	germanium
L101	24-83601K01	COIL, RF: 18-1/2 turns
L102	24-84972A06	8-1/2 turns; coded ORG
L103	24-84972A04	8-1/2 turns; coded WHT
L104, 106	24-82839C15	0.82 uH
L105	24-84972A05	6-1/2 turns; coded RED
L107	24-84972A26	3-1/2 turns; coded BLU
L108	24-84972A11	1-1/2 turns
L109, 112	24-800484	0.31 uH
L110	24-83886G01	3-1/2 turns
L113M	24-83886C07	2-1/2 turns; coded GRN (10-watt)
L113H	24-83886G01	1-1/2 turns; coded BRN (10-watt)
L113M, H	24-83886C04	4-1/2 turns (25-watt models)
L114	24-83601K01	18-1/2 turns; (2-freq. only)
Q100, 109, 111, 112	48-869643	TRANSISTOR: (SEE NOTE) PNP, type M9643
Q101, 102	48-869642	NPN, type M9642
Q103, 104, 105, 106	48-869494	NPN, type M9494
Q108	48-869671	PNP, type M9671
Q110	48-869651	NPN, type M9651

	26-82570L01	HEATSINK: 1.20 x .90" (used with U2)
	26-82471L01	HEATSINK: .59 x .32" (used with U2)

NOTE:
For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.

Parts with "*" indicate components that are also used with 25 W Power Amplifier Models. All other 10 Watt Power Amplifier parts are deleted in 25-Watt Models.)

Power Amplifier, 10 Watt:
P/O Unified Chassis is 10 Watt Models PL-3354-(1)

C250M	20-83201B01	CAPACITOR, fixed: pF ±5%; 500 V, unless otherwise stated var; 20-115 pF
C250H	20-83201B02	var; 8-60 pF
C251	21-8359XE10	220 ±20%; 500 V
C252	21-82372C04	.05 uF +80-20%, 25 V
C253	21-8645SB36	15
C254	20-83201B02	var; 8-60 pF
C255M, 256M	21-8340SD79	18; N150
C255H, 256H	21-8340SD97	15; NP0
C251M	21-83406D82	36; NP0
C256H	21-83406D69	30; NP0
C257M	21-8340SD71	33; NP0
C251H	21-83406D68	27; NP0
C255, 261	21-8340SD79	18; N150
C260	21-82204B06	100 ±10%; 500 V
	or 21-8359XE10	220 ±20% (25-watt models only)
C262*	23-8653BC04	15 uF
C263	21-857845	3 a. 5
C264	21-8359XE10	220 ±20% (10-watt models only)
CR250	48-83510T04	DIODE: (SEE NOTE) silicon
L261	24-83977B01	COIL, RF: 1-1/2 turns
L251	24-84346A02	choke: 230 nH
L252	24-83886C06	4-1/2 turns; coded WHT
L253*	24-84984G04	7-1/2 turns; coded YEL
L254M, 255M, 256M	24-83884C09	6-1/2 turns, coded BLU
L254H, 255H, 256H, 257	24-83884C08	5-1/2 turns, coded ORG
Q250	48-869860	TRANSISTOR: (SEE NOTE) NPN; type M9860
R251	64-125C47	RESISTOR, fixed: ±10%; 1/4 W, unless otherwise stated 100
R252	64-124C63	820; 1/2 W
R253*	64-124D55	2.7
R254	64-125C07	18; 1/2 W
		NON-REFERENCED ITEM
	26-84716D01	HEATSINK

NOTE:
For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q110	48-869649	PNP; type M9649
Q113	48-869640	NPN; type M9640
R101	64-124C43	RESISTOR, fixed: ±5%; 1/4 W, unless otherwise stated 560 ±10%
R102, 104	64-124A83	27k
R103, 105	64-124A93	68k
R106, 151	64-124A63	110
R108	64-124A57	2.2k
R109, 110, 122	64-124A87	5.6k
R111, 148, 149	64-124A69	6.8k
R112, 123	64-124A73	10k
R113	64-124A51	8.2k
R114	64-124C59	2.7k ±10%
R115, 131	18-84944C02	var; 25k
R116	64-124C67	5.6k ±10%
R117	64-124D32	150k
R118	64-124B04	180k
R119	64-124A65	4.7k
R120	64-124A75	12k
R121	64-124A49	1k
R124	64-124C51	1.8k
R125	64-124C37	330 ±10%
R126, 127	64-124C33	220 ±10%
R128	64-124C27	120
R129	64-124C63	3.9k ±10%
R130	64-124C25	100 ±10%
R132	64-124C67	5.6k ±10% (2-freq. only)
R133	64-124B04	150k; (2-freq. only)
R134	64-124B04	180k; (2-freq. only)
R135	64-124A61	4.3k (2-freq. only)
R136	64-124C75	12k ±10%; (2-freq. only)
R137	64-124A49	1k. (2-freq. only)
R138	64-124C17	47 ±10%
R139	64-124D61	4.7 ±10%
R140	18-84944C04	variable; 500
R141	64-124C35	270 ±10%
R142	64-125C29	150 ±10%, 1/2 W
R143	64-125C47	820 ±10%; 1/2 W
R147, 150	64-124C49	1k ±10%
R144	64-124A53	1.5k
R145	17-82036C49 or 17-82036C49	0.1-5-2 W (10-watt models) .05-5-2 W (25-watt models)
R146	64-124A59	2.7k
R152	64-124D01	10 ±10%
R153, 154	64-125A25	100 ±5%, 1/2 W
R154	64-124A85	33k
R155	64-125C53	1.5k ±10%
RT101	63-8600K01	THERMISTOR: 1k @25°C
VR101	48-8225&C43	VOLTAGE REGULATOR: Zener type, 9.1 V
Y101, Y102	KXN6121AA	CRYSTAL: 16.7555-19.3333 MHz (1 & 2 freq.)
	NON-REFERENCED ITEMS	
	9-83487K01	SOCKET, for Y101, Y102
	26-84598A01	SHIELD, coil
	76-83960J01	FERRITE BEAD

NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN6177B "Private-Line" Encoder/Decoder PL-3340-D

C401, 412, 427	21-82372C01	CAPACITOR, fixed: uf ±10%; 100 V, unless otherwise stated 0.1 +80-20%; 25 V
C402, 403, 405, 410	21-82428B59	.01 +80-20%; 200 V
C404	21-82428B23	.0012
C406, 411, 413, 414, 420, 422, 435, 437	21-83596E10	220 pF ±20%; 500 V
C407, 408, 410, 416, 421, 428, 436	23-84665F01	10 +100-0%; 25 V
C409, 418, 419	21-82428D09	.0047
C415	21-82096J20	0.22; 250 V
C417, 429, 431	23-84665F04	1 +150-0%; 50 V
C423, 424, 425, 435	8-84696D04	.047 ±20%; 100 V
C425	8-82909C31	0.15; 50 V
C434	8-83813H01	.0068
C438	8-82096J20	0.22; 250 V
C439	21-82428B28	.002
CR401	48-836541H01	DIODE: (SEE NOTE) NOT USED
CR402, 405, 407, 409, CR404	48-821981H02	silicon; germanium
L401	25-824981H02	COIL: 6 H
Q401, 402, 408, 409	48-134667	TRANSISTOR: (SEE NOTE) NPN; type M54
Q403, 404, 405, 407	48-869642	NPN; type M9642
Q406	48-869628	NPN; type M9628
Q407	48-869643	PNP; type M9643
R401, 402, 404, 440	64-124D02	RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated 150k
R403, 404, 405, 407, 411, 417	64-124A99	120k ±5%
R408, 428, 447	64-124C49	1k
R409	64-124C69	6.8k
R410	64-124C65	5.9k
R412, 418, 446	64-124C85	33k
R413, 419	64-124C55	1.8k
R414, 420	64-124C37	330
R415	64-124C93	68k
R416	64-124C73	4.7k
R421, 435	64-124C87	22k
R424	64-124C67	5.6k
R425	64-124C83	27k
R426, 438, 444, 446	64-124C73	10k
R427	64-124C79	18k
R429	64-124C83	27k
R430	64-124C33	220
R431	64-124C61	3.3k
R432	64-124C57	2.2k
R433	18-84944C02	variable; 25k
R434	64-124C53	1.5k
R436	64-124C45	680
R437, 442, 448	64-124C97	100k
R441	64-124C89	47k
R445	64-124C77	15k
R449	64-124C73	10k
RT401	6-82990E18	THERMISTOR: 190 ohms
U401	51-84267A04	INTEGRATED CIRCUIT: (SEE NOTE) type 67A04
VR401	48-82256C25	DIODE: (SEE NOTE) Zener type, 12 V
	NON-REFERENCED ITEMS	
	TLN6709B	"VIBRASPONDER", resonant reed
	42-84116B02	SOCKET, "Vibraspondер"
	39-10184A10	CONTACT, push-pin; male
	39-10184A24	CONTACT, push-pin; female; 9 req'd.
	29-84706E06	PIN, female; molex

NOTE: For optimum performance, replacement diodes, transistors, and integrated circuits must be ordered by Motorola part number.

REVISIONS

CHASSIS AND SUFFIX NO	REF SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
TUD8E9AA-D	CR107	ADDED 48-836541H03	BUFFER CIRCUIT	MAIN CIRCUIT BD, DETAIL PEPS-17222-B
TUD8E9AA	C157	ADDED 23-871966, 6.8 uF	EXCITER OUTPUT	
TUD8E9AA	R264	ADDED 220 Ω	POWER AMPLIFIER	
TUD8E9AA		DELETE CHANGES		
TUD8E9AA-1	C104	FROM 21-84500B01, 2.2 pF TO 21-84513A35, 3 pF		
TUD8E9AA-1	C108	FROM 21-82133G39, 8.2 pF TO 21-84713A35, 5 pF		
TUD8E9AA-1	C131	FROM 21-83406D71, 33 pF; NP0 TO 21-82133G81, 33 pF; N150		
TUD8E9AA-1	C132	FROM 21-83406D02, 5 pF TO 21-84693B40, 6 pF		
TUD8E9AA-1	C133	FROM 21-82261C36, 47 pF TO 21-84713A39, 9 pF		
TUD8E9AA-1	C14	FROM 21-82204B06, 100 pF TO 21-82877B15, 120 pF		
TUD8E9AA-1	C15M	FROM 21-84251C02, 43 pF TO 21-82240K05, 50 pF		
TUD8E9AA-1	C15H	FROM 21-84251C01, 39 pF TO 21-64793		
TUD8E9AA-1	C16M	FROM 21-82133G79, 6.1 pF TO 21-84713A30, 9 pF		
TUD8E9AA-1	C16H	FROM 21-82133G76, 5.8 pF TO 21-84713A40, 7 pF		
TUD8E9AA-1	C17	FROM 21-82428B07, 0.5 pF TO 21-84205L, 0.35 pF		
TUD8E9AA-1	C42	FROM 21-82261C35, 110 pF TO 21-82258G12		
TUD8E9AA-1	C58	FROM 21-82633 100 pF TO 21-82877B36, 250 pF		
TUD8E9AA-1	C62	FROM 21-82496E11, 4 pF TO 21-83406D70, 3.3 pF		
TUD8E9AA-1	L21, 22	FROM 24-84451G04 TO 24-84451G04		
TUD8E9AA-1	L61	FROM 24-83601K01, 18-1/2 turns TO 24-84972C09, 21-1/2 turns for 10-watt models		
TUD8E9AA-1	R14	FROM 6-124C49, 6.8k ±10% TO 6-124A69, 6.8K ±5%		
TUD8E9AA-1	R36	FROM 6-124C36, 300 ±10% TO 6-124A39, 390 ±5%		
TUD8E9AA-1	C112, 145	ADD 21-82261C3, 10K pF; 50 V		
TUD8E9AA-1	C112M, 145M	FROM 21-845997, 82 pF; N330 TO 21-82204B51, 82 pF; N150		
TUD8E9AA-1	C112H, 145H	FROM 21-82261C21, 56 pF; N220 TO 21-84694B12, 20 pF		
TUD8E9AA-1	R140	FROM 18-84944C02, 25K TO 18-84944C04, 500		
TUD8E9AA-1	R141	FROM 6-124C37, 330 ±10% TO 6-124C47, 820; 1/2 W		
TUD8E9AA-1	R143	FROM 6-124C49, 1K, 1/4 W TO 6-125C47, 820; 1/2 W		

REVISIONS

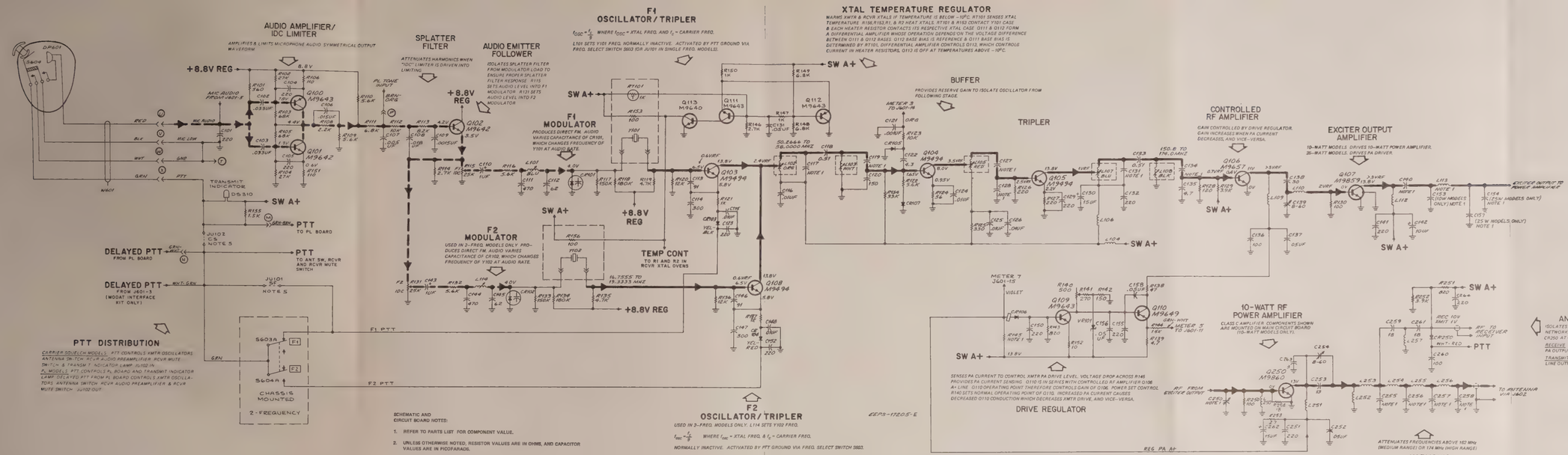
CHASSIS AND SUFFIX NO	REF SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
TRN6177A-1A				
TRN6177A-1A	C1	FROM 21-84500B01, 2.2 pF TO 21-84513A35, 3 pF		
TRN6177A-1A	C2	FROM 21-82133G39, 8.2 pF TO 21-84713A35, 5 pF		
TRN6177A-1A	C13M	FROM 21-83406D71, 33 pF; NP0 TO 21-82133G81, 33 pF; N150		
TRN6177A-1A	C13H	FROM 21-83406D02, 5 pF TO 21-84693B40, 6 pF		
TRN6177A-1A	C14	FROM 21-82204B06, 100 pF TO 21-82877B15, 120 pF		
TRN6177A-1A	C15M	FROM 21-84251C02, 43 pF TO 21-82240K05, 50 pF		
TRN6177A-1A	C15H	FROM 21-84251C01, 39 pF TO 21-64793		
TRN6177A-1A	C16M	FROM 21-82133G79, 6.1 pF TO 21-84713A30, 9 pF		
TRN6177A-1A	C16H	FROM 21-82133G76, 5.8 pF TO 21-84713A40, 7 pF		
TRN6177A-1A	C17	FROM 21-82428B07, 0.5 pF TO 21-84205L, 0.35 pF		
TRN6177A-1A	C42	FROM 21-82261C35, 110 pF TO 21-82258G12		
TRN6177A-1A	C58	FROM 21-82633 100 pF TO 21-82877B36, 250 pF		
TRN6177A-1A	C62	FROM 21-82496E11, 4 pF TO 21-83406D70, 3.3 pF		
TRN6177A-1A	L21, 22	FROM 24-82815G26, 0.5 uH TO 24-82723H07, 10 uH		
TRN6177A-1A	L61	FROM 24-83601K01, 18-1/2 turns TO 24-84972C09, 21-1/2 turns for 10-watt models		
TRN6177A-1A	R14	FROM 6-124C49, 6.8k ±10% TO 6-124A69, 6.8K ±5%		
TRN6177A-1A	R36	FROM 6-124C36, 300 ±10% TO 6-124A39, 390 ±5%		
TRN6177A-1A	C112, 145	ADD 21-845997, 82 pF; N330		
TRN6177A-1A	C112M, 145M	TO 21-82204B51, 82 pF; N150		
TRN6177A-1A	C112H, 145H	TO 21-82261C21, 56 pF; N220		
TRN6177A-1A	R140	FROM 18-84944C02, 25K TO 18-84944C04, 500		
TRN6177A-1A	R141	FROM 6-124C37, 330 ±10% TO 6-124C47, 820; 1/2 W		
TRN6177A-1A	R143	FROM 6-124C49, 1K, 1/4 W TO 6-125C47, 820; 1/2 W		

	33-82599D06	SCREW, machine: No. 6 32TPI x .375 inch
	13-84599B01	EMBLEM
	38-84559B01	PUSHBUTTON
	3-132436	SCREW, machine: No. 6 32TPI x 3 req'd.
	4-7669	WASHER, lock: No. 6 split; 3 req'd.
	4-114201	WASHER, flat: 1/4" x 0.156" x 0.015"; 3 req'd.
	1-80709B93	HOUSING, microphone (rear)
	3-129498	SCREW, lock: No. 6-32 TPI x .375 inch "Phillips" round head; 2 req'd.
	4-7666	LOCK
	42-852710	STRAP
	3-124693	SCREW: "Phillips" round head; 2 req'd.
	15-82701B12	COVER, microphone (front)
	42-82702B02	RETAINER, cartridge
	32-82703B01	GASKET, neoprene

		TRN6177A-1A Not Equipped
	or 59-82933C01	dynamic: includes transistor
W601	30-82565B34	CORD, microphone; coiled 4-conductor; includes 4-conductor; includes TERMINAL, PIN, female; (4 req'd.) 41-835707 SPRING, strain relief 29-83277G02 LUG; 4 req'd.
S604	40-82263U02	dpst
		NON-REFERENCED ITEMS
	33-82599D06	SCREW, machine: No. 6 32TPI x .375 inch
	13-84599B01	EMBLEM
	38-84559B01	PUSHBUTTON
	3-132436	SCREW, machine: No. 6 32TPI x 3 req'd.
	4-7669	WASHER, lock: No. 6 split; 3 req'd.
	4-114201	WASHER, flat: 1/4" x 0.156" x 0.015"; 3 req'd.
	1-80709B93	HOUSING, microphone (rear)
	3-129498	SCREW, lock: No. 6-32 TPI x .375 inch "Phillips" round head; 2 req'd.
	4-7666	LOCK
	42-852710	STRAP
	3-124693	SCREW: "Phillips" round head; 2 req'd.
	15-82701B12	COVER, microphone (front)
	42-82702B02	RETAINER, cartridge
	32-82703B01	GASKET, neoprene

UNIFIED CHASSIS EXCITER SECTION

FUNCTION -
Amplifies voice signals from the microphone and produces a low-level FM modulated rf signal for the rf power amplifier.

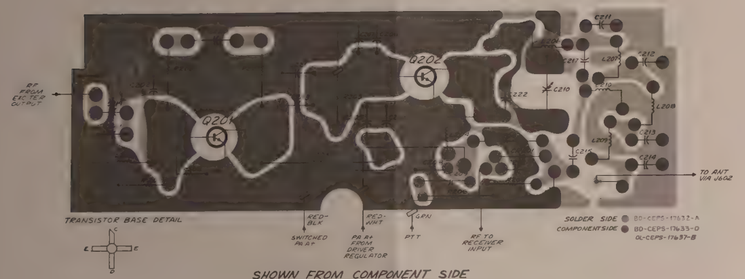

AUDIO AMPLIFIER/ IDC LIMITER
AMPLIFIES & LIMITS MICROPHONE AUDIO. SYMMETRICAL OUTPUT WAVEFORM
SPLATTER FILTER
ATTENUATES HARMONICS WHEN "IDC" LIMITER IS DRIVEN INTO LIMITING
AUDIO EMITTER FOLLOWER
ISOLATES SPLATTER FILTER FROM MODULATOR LOAD TO ENSURE PROPER SPLATTER FILTER RESPONSE. R115 SETS AUDIO LEVEL INTO F1 MODULATOR. R121 SETS AUDIO LEVEL INTO F2 MODULATOR
F1 OSCILLATOR/TRIPLER
$f_{OSC} = \frac{f_c}{3}$ WHERE f_{OSC} = XTAL FREQ. AND f_c = CARRIER FREQ.
L101 SETS Y101 FREQ. NORMALLY INACTIVE. ACTIVATED BY PTT GROUND VIA P403. SELECT SWITCH S603 FOR "AUTO" IN SINGLE FREQ. MODELS.
XTAL TEMPERATURE REGULATOR
WARMS XMTR & RCVR XTALS IF TEMPERATURE IS BELOW +10°C. RT101 SENSES XTAL TEMPERATURE. R156,R153,R1, & R3 HEAT XTALS. RT101 & R153 CONTACT Y101 CASE & EACH HEATER RESISTOR CONTACTS ITS RESPECTIVE XTAL CASE. Q111 & Q112 FORM A DIFFERENTIAL AMPLIFIER WHOSE OPERATION DEPENDS ON THE VOLTAGE DIFFERENCE BETWEEN Q111 & Q112 BASES. Q112 BASE BIAS IS REFERENCE & Q111 BASE BIAS IS DETERMINED BY RT101, DIFFERENTIAL AMPLIFIER CONTROLS D113, WHICH CONTROLS CURRENT IN HEATER RESISTORS, D113 IS OFF AT TEMPERATURES ABOVE +10°C.
BUFFER
PROVIDES RESERVE GAIN TO ISOLATE OSCILLATOR FROM FOLLOWING STAGE.
TRIPLER
CONTROLLED RF AMPLIFIER
GAIN CONTROLLED BY DRIVE REGULATOR. GAIN INCREASES WHEN PA CURRENT DECREASES, AND VICE-VERSA.
EXCITER OUTPUT AMPLIFIER
10-WATT MODELS: DRIVES 10-WATT POWER AMPLIFIER.
25-WATT MODELS: DRIVES PA DRIVER.
F2 MODULATOR
USED IN 2-FREQ. MODELS ONLY. PRODUCES DIRECT FM. AUDIO VARIES CAPACITANCE OF CR102, WHICH CHANGES FREQUENCY OF Y102 AT AUDIO RATE.
F1 MODULATOR
PRODUCES DIRECT FM. AUDIO VARIES CAPACITANCE OF CR101, WHICH CHANGES FREQUENCY OF Y101 AT AUDIO RATE.
TEMP CONT
TO R1 AND R2 IN RCVR XTAL OVENS
F2 OSCILLATOR/TRIPLER
USED IN 2-FREQ. MODELS ONLY. L114 SETS Y102 FREQ.
$f_{OSC} = \frac{f_c}{3}$ WHERE f_{OSC} = XTAL FREQ. & f_c = CARRIER FREQ.
NORMALLY INACTIVE. ACTIVATED BY PTT GROUND VIA FREQ. SELECT SWITCH S603.
10-WATT RF POWER AMPLIFIER
CLASS C AMPLIFIER. COMPONENTS SHOWN ARE MOUNTED ON MAIN CIRCUIT BOARD (10-WATT MODELS ONLY).
DRIVE REGULATOR
SENSES PA CURRENT TO CONTROL XMTR PA DRIVE LEVEL. VOLTAGE DROP ACROSS R145 PROVIDES PA CURRENT SENSING. Q110 IS IN SERIES WITH CONTROLLED RF AMPLIFIER Q106. A=LINE. Q110 OPERATING POINT THEREFORE CONTROLS GAIN OF Q106. POWER SET CONTROL R140 SETS NORMAL OPERATING POINT OF Q110. INCREASED PA CURRENT CAUSES DECREASED Q110 CONDUCTION WHICH DECREASES XMTR DRIVE, AND VICE-VERSA.
HARMONIC FILTER
ATTENUATES FREQUENCIES ABOVE 162 MHz (MEDIUM RANGE) OR 174 MHz (HIGH RANGE).
ANTENNA SWITCH
ISOLATES RCVR INPUT DURING TRANSMISSION.
NETWORK C259-L261 C261 = 1/4 WAVE TRANSMISSION LINE
CR260 AT OUTPUT END.
RECEIVE: PTT UNGROUNDED. CR260 NONCONDUCTING (OPEN CIRCUIT). 1/4 WAVE LINE INPUT Z = 50 OHMS. PA OUTPUT CIRCUIT IS HIGH IMPEDANCE TO RECEIVED RF. RF PASSES TO RCVR RF INPUT.
TRANSMIT: PTT IDEALYZED PTT IN PL MODELS) GROUNDED. CR260 CONDUCTS (SHORT CIRCUIT). SHORT AT 1/4 WAVE LINE OUTPUT CAUSES "OPEN" AT LINE INPUT. XMTR RF IS BLOCKED FROM RCVR RF INPUT.
PTT DISTRIBUTION
CARRIER SQUELCH MODELS: PTT CONTROLS XMTR OSCILLATORS, ANTENNA SWITCH, RCVR AUDIO PREAMPLIFIER, RCVR MUTE SWITCH, & TRANSMIT INDICATOR LAMP. J1102 IN PL MODELS: PTT CONTROLS PL BOARD AND TRANSMIT INDICATOR LAMP. DELAYED PTT FROM PL BOARD CONTROLS XMTR OSCILLATORS, ANTENNA SWITCH, RCVR AUDIO PREAMPLIFIER & RCVR MUTE SWITCH. J1102 OUT.
SCHEMATIC AND CIRCUIT BOARD NOTES:
1. REFER TO PARTS LIST FOR COMPONENT VALUE.
2. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS, AND CAPACITOR VALUES ARE IN PICOFARADS.
3. VOLTAGE NOTATIONS ARE AS FOLLOWS:
T = TRANSMITTER KEYED
R = RECEIVE (TRANSMITTER UNKEYED)
U = RECEIVER UNSQUELCHED
S = RECEIVER FULLY SQUELCHED
4. UNLESS OTHERWISE NOTED, DC VOLTAGES ARE MEASURED WITH A 20,000 OHMS-PER-VOLT METER, AND RF VOLTAGES ARE MEASURED WITH AN RF VOLTMETER.
5. REFER TO THE JUMPER TABLE FOR JUMPER CONNECTIONS USED IN VARIOUS RADIO MODELS. SF = SINGLE FREQUENCY JUMPER. CS = CARRIER SQUELCH JUMPER.
6. U2 VOLTAGES MEASURED WITH VOLUME CONTROL FULLY COUNTERCLOCKWISE (MINIMUM VOLUME).
7. THE COMPONENTS ENCLOSED IN THE HEAVY DASHED OUTLINE PLUS R251, R252, AND R253 FORM THE 10-WATT POWER AMPLIFIER. IN THE 10 W PARTS LIST ALL THE PARTS EXCEPT THOSE INDICATED WITH * ARE OMITTED FOR 25-WATT MODELS. IN ADDITION C140, C153, C154, C157, C290, L81, L113, AND R146 CHANGE VALUE OR ARE OMITTED IN 25-WATT MODELS AS SHOWN IN PARTS LIST. THE 25 WATT P.A. MOUNTS ON A SEPARATE CIRCUIT BOARD AND IS SHOWN ON ITS OWN PAGE IN THIS MANUAL.
NEPS-17209-C
EEPS-17205-E
LEGEND
= THEORY OF OPERATION DATA
= PRIMARY RF SIGNAL FLOW
= PRIMARY AUDIO SIGNAL FLOW

25-WATT POWER AMPLIFIER, HARMONIC FILTER, AND ANTENNA SWITCH

MODELS TLD2042A (150.8-162 MHz)
TLD2043A (162-174 MHz)

FUNCTION

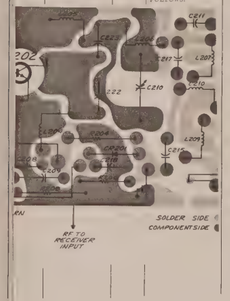
Optimally increases power output of radio to 25 watts.



SHOWN FROM COMPONENT SIDE

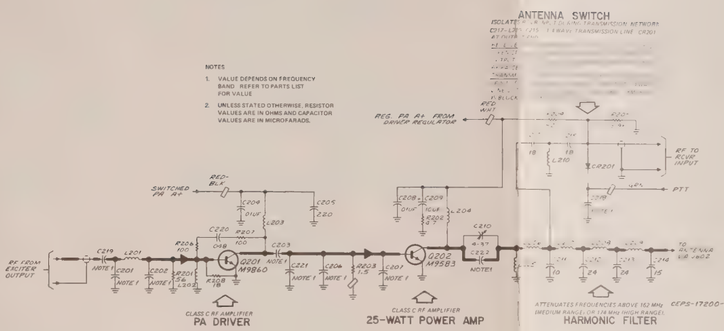
REVISIONS LBD81031E38-O

DIAG ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE
	TLD2042A TLD2043A	C201M	FROM 21-84494B25, 43 pF TO 21-868822, 51 pF
		C201H	FROM 21-84494B28, 39 pF TO 21-84494B25, 43 pF
		C219M	FROM 21-84494B01, 51 pF TO 21-868822, 51 pF
		C219H	FROM 21-8407?2, 36 pF TO 21-84494B24, 39 pF
		C221M	FROM 21-84494B25, 43 pF TO 21-84494B34, 68 pF
		C221H	FROM 21-8521?2, 62 pF TO 21-868822, 51 pF
		C222	FROM 21-84494B43, 24 pF TO 21-84494B39, 15 pF
		C220	REMOVED 21-8482?2, 20 pF
		C?	REMOVED 21-84494B41, 24 pF
		L201	FROM 24-83884C01 TO 24-84614A01
		L201	TOP VIEW CHANGED
			PRINTED CIRCUIT BOARD REVISED. CIRCUIT WAS AS FOLLOWS:



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		PARTS LIST
		LEGEND M = 150.8-162 MHz H = 162-174 MHz
		TLD2042A Power Amplifier (150.8-162 MHz) TLD2043A Power Amplifier (162-174 MHz) PL-3360-D
		CAPACITOR, fixed: pF ±5%, 500 V unless otherwise stated
C201M	21-868822	51 ±5%
C201H	21-84494B28	43
C202	21-84494B34	68
C203M	21-84494B07	150
C203H	21-84494B27	140 ±3%
C204, 208	21-832501	.01 uF +80-40%; 250 V
C205	21-83596Z10	220 ±10%
C206M, 207H	21-84494B34	68
C206H	21-84494B02	62
C207M	21-84494B31	75
C209	23-84762H03	10 uF; 20 V
C210	20-84579D03	variable; 4-37.5 pF
C211	21-84494B29	10 ±2%; 300 V
C212, 213	21-84494B41	24
C214	21-84494B38	15
C215, 217	21-83406D79	18
C216		NOT USED
C218M	21-84494B04	100
C218H	21-865941	90 ±2%; 300 V
C219M	21-868822	51 ±5%
C219H	21-84494B24	39
C220	8-82905G03	.047 uF ±10%; 50 V
C221M	21-84494B34	68
C221H	21-868822	51 ±5%
C222	21-84494B35	15
CR201	48-83510F04	DIODE: (SEE NOTE) Pin
L201		COIL: part of printed circuit board plating
L202	24-83977B01	CHOKE
L203	24-84346A02	210 nH
L204	24-84614A03	2-1/2 turns
L205	24-84614A05	1-1/2 turns
L206	24-83884G04	7-1/2 turns
L207H	24-83884C08	5-1/2 turns
L207M, 208H	24-83884G09	6-1/2 turns
L208M	24-83884G04	7-1/2 turns
L209M	24-83884G09	6-1/2 turns
L210, 209H	24-83884G08	5-1/2 turns
Q201	48-869860	TRANSISTOR: (SEE NOTE) NPN; type M9860
Q202	48-869583	NPN; type M9583
R201	6-124C19	RESISTOR, fixed: ±10%; 1/2 W unless otherwise stated 56; 1/4 W
R202	6-124B61	4.7; 1/4 W
R203	17-82036G07	1.5; 1 W
R204	6-125C47	820
R205	6-124C63	3.9K; 1/4 W
R206, 207	6-125C85	100
R208	6-125C07	18
		NON-REFERENCED ITEM
	26-83136K01	HEATSINK

NOTE: For optimum performance, replacement diodes and transistors must be ordered by Motorola part number.

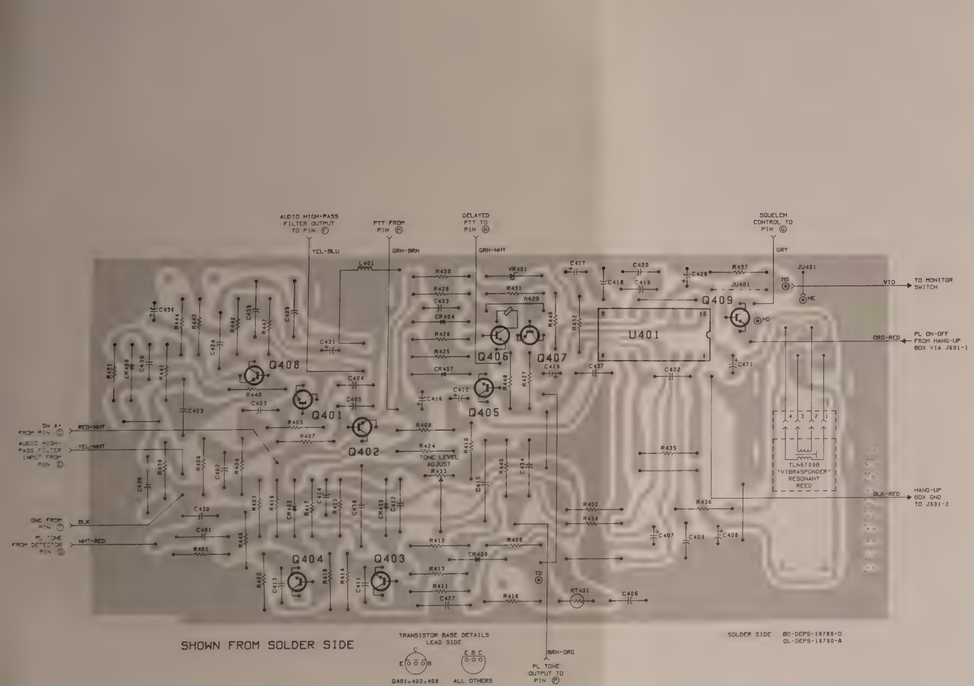


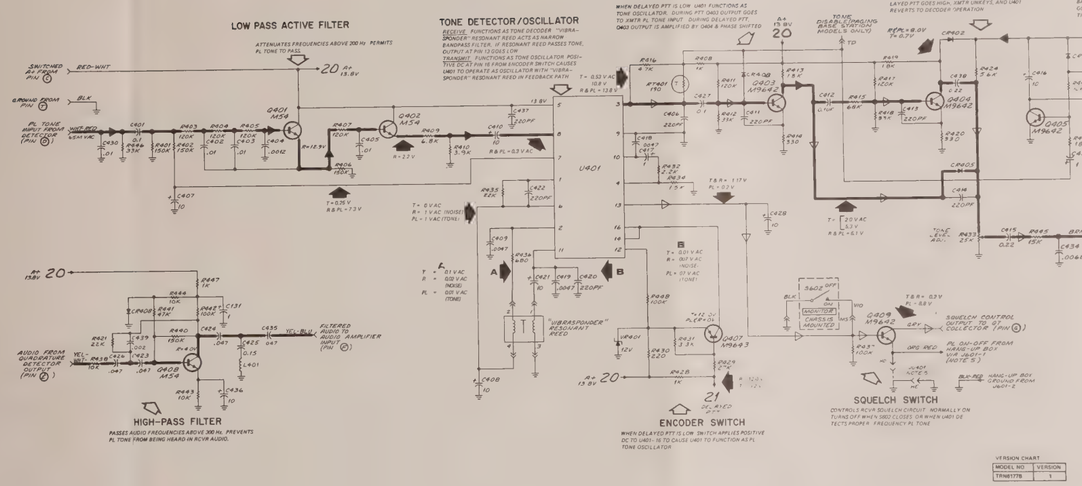
TONE "PRIVATE-LINE" ENCODER/DECODER

MODEL TRN6177B

FUNCTION --

Encodes and decodes sub-audible "Private-Line" tones. Encoder modulates transmitter and delays transmitter turn-off 150 mS to allow transmission of turn-off reverse tone burst. Decoder detects received tone and unsquelches receiver when proper tone is received.


AUDIO HIGH-PASS FILTER OUTPUT TO PIN (F)
PTT FROM PIN (K)
DELAYED PTT TO PIN (N)
SQUELCH CONTROL TO PIN (M)
TO MONITOR SWITCH
PL ON-OFF FROM HANG-UP BOX VIA J601-1
HANG-UP BOX GND TO J601-2
SHOWN FROM SOLDER SIDE
TRANSISTOR BASE DETAILS LEAD SIDE
Q401,402,408 ALL OTHERS
PL TONE OUTPUT TO PIN (F)
SOLDER SIDE 80-DEPS-19785-D
DL-DEPS-19785-A


LOW PASS ACTIVE FILTER
ATTENUATES FREQUENCIES ABOVE 200 Hz. PERMITS PL TONE TO PASS.
TONE DETECTOR/OSCILLATOR
RECEIVE: FUNCTIONS AS TONE DECODER "VIBRASPONDER" RESONANT REED ACTS AS NARROW BANDPASS FILTER. IF RESONANT REED PASSES TONE, OUTPUT AT PIN 13 GOES LOW. TRANSMIT: FUNCTIONS AS TONE OSCILLATOR. POSITIVE DC AT PIN 16 FROM ENCODER SWITCH CAUSES U401 TO OPERATE AS OSCILLATOR WITH "VIBRASPONDER" RESONANT REED IN FEEDBACK PATH.
TONE AMPLIFIER
WHEN DELAYED PTT IS LOW, U401 FUNCTIONS AS TONE OSCILLATOR. DURING PTT OFF, Q403 OUTPUT GOES TO XMTR PL TONE INPUT. DURING DELAYED PTT, Q403 OUTPUT IS AMPLIFIED BY Q404 & PHASE SHIFTED
REVERSE BURST AMPLIFIER
PREVENTS SQUELCH TAIL IN PL OPERATION
PTT UNGROUNDED: Q406 ON, NO TONE PRESENT BECAUSE U401 FUNCTIONS AS DECODER
PTT GROUNDED: Q406 DISABLED BY GROUND THROUGH CR402. CR408 FORWARD BIASED. PL TONE FROM Q403 PASSES THROUGH CR408 & FOLLOWING COMPONENTS TO PL TONE INPUT OF XMTR
PTT DELAY: PTT UNGROUNDED: Q406 ON. CR405 REVERSE BIASED. DELAYED PTT IS LOW SO XMTR REMAINS KEYED & U401 PRODUCES PL TONE. PL TONE FROM Q403 IS BLOCKED FROM XMTR BY CR405. PL TONE TO XMTR FROM Q406 IS 240° OUT OF PHASE WITH TONE FROM Q403. AFTER ABOUT 150 mS DELAYED PTT GOES HIGH, XMTR UNKEYS, AND U401 REVERTS TO DECODER OPERATION
PTT DELAY CIRCUIT
PTT UNGROUNDED: DELAYED PTT HIGH. Q406 OFF. Q408 OFF. C416 CHARGED TO 4+. U401 FUNCTIONS AS TONE DECODER
PTT GROUNDED: DELAYED PTT LOW THROUGH CR404. Q406 OFF. Q405 TURNS OFF AFTER C416 CHARGES. C416 DISCHARGES THROUGH PTT & CR407. ENCODER SWITCH TURNS ON AND CAUSES U401 TO FUNCTION AS TONE DECODER
PTT DELAY: PTT UNGROUNDED: Q405 OFF, Q406 TURNS ON. KEYING DELAYED PTT LOW. C416 CHARGES THROUGH R428 & Q406 B-E JUNCTION. AFTER ABOUT 150 mS C416 CHARGES ENOUGH FOR Q406 TO START TURNING OFF. Q405 THEN TURNS ON, PULLING Q406 BASE LOW. Q406 TURNS OFF. DELAYED PTT LINE GOES HIGH AND U401 RESUMES TONE DECODER FUNCTION
HIGH-PASS FILTER
PASSES AUDIO FREQUENCIES ABOVE 300 Hz. PREVENTS PL TONE FROM BEING HEARD IN RCVR AUDIO.
ENCODER SWITCH
WHEN DELAYED PTT IS LOW, SWITCH APPLIES POSITIVE DC TO U401-16 TO CAUSE U401 TO FUNCTION AS PL TONE OSCILLATOR
SQUELCH SWITCH
CONTROLS RCVR SQUELCH CIRCUIT. NORMALLY ON. TURNS OFF WHEN 5802 CLOSES OR WHEN U401 DETECTS PROPER FREQUENCY PL TONE
EEP3-17210-E

NOTES:

1. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
2. VOLTAGE NOTATIONS ARE AS FOLLOWS
   - T = TRANSMITTER KEYED
   - R = RECEIVE, NO TONE PRESENT
   - PL = RECEIVE, TONE PRESENT
3. ALL DC VOLTAGES MEASURED WITH 20 000 OHM-PER-VOLT METER UNLESS OTHERWISE NOTED
4. ALL AC VOLTAGES ARE RMS VALUES
5. CONNECT JU601 TO PIN HE WHEN HANG-UP BOX IS USED. CONNECT JU601 TO PIN HO WHEN HANG-UP BOX IS NOT USED

LEGEND

- = THEORY OF OPERATION DATA
- = MAINTENANCE DATA
- = RECEIVE SIGNAL
- = TRANSMIT SIGNAL
- = PTT CONTROL SIGNAL
- = SQUELCH CONTROL SIGNAL

VERSION CHART

MODEL NO.	VERSION
TRN6177B	1

REFER TO 68P81031E37 (SHEET 3 OF 4) FOR PARTS LIST

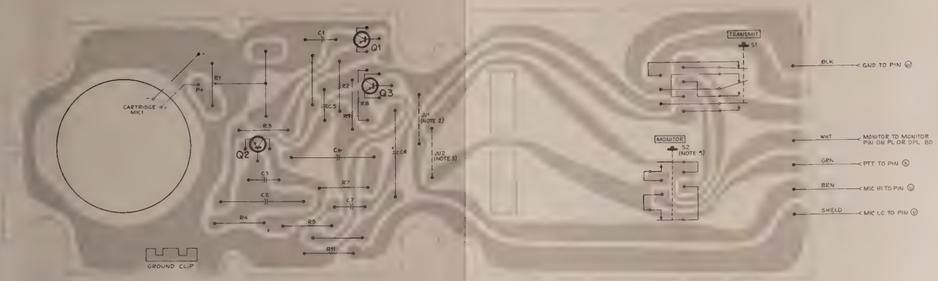
68P81029E99-B
6/1/76-NPC

DESK MICROPHONES

MODELS TMN1008A, TMN1009A, TMN1010A & TMN1011A

FUNCTION

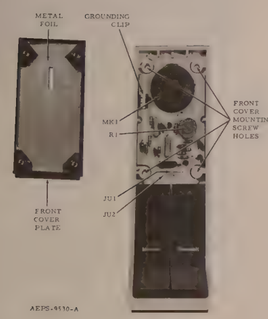
The desk microphones provide a desk surface self-supporting stand to mount the PTT and PL monitor switches and to support the dynamic cartroid microphone element at mouth level. The TMN1008A and TMN1010A are used in Private-Line squelch systems and provide both PTT and monitor switches; the TMN1009A and TMN1011A are used carrier squelch systems and use only the PTT switch.



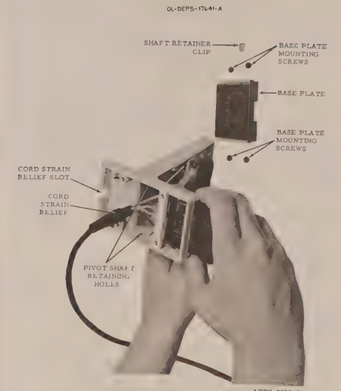
E B C

TRANSISTOR DETAIL

SHOWN FROM COMPONENT SIDE

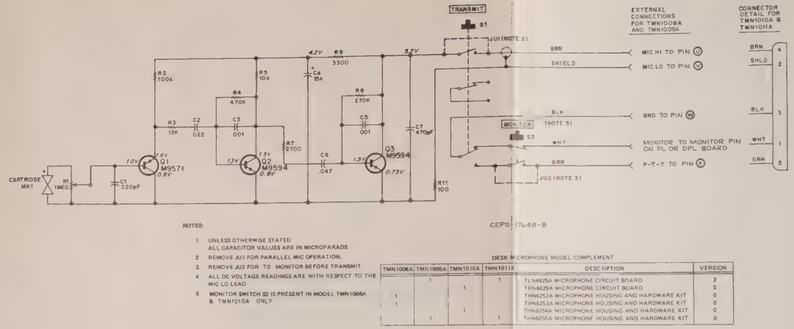


AEPS-9430-A



AEPS-9528-O

MICROPHONE DETAIL



CEPS-17648-B

NOTES:

1. UNLESS OTHERWISE STATED ALL CAPACITOR VALUES ARE IN MICROFARADS
2. REMOVE JU1 FOR PARALLEL MIC OPERATION.
3. REMOVE JU2 FOR TO MONITOR BEFORE TRANSMIT
4. ALL DC VOLTAGE READINGS ARE WITH RESPECT TO THE MIC LO LEAD
5. MONITOR SWITCH S2 IS PRESENT IN MODEL TMN1008A & TMN1010A ONLY.

DESK MICROPHONE MODEL COMPLEMENT

TMN1008A	TMN1009A	TMN1010A	TMN1011A	DESCRIPTION	VERSION
1	1	1	1	TLN4925A MICROPHONE CIRCUIT BOARD	2
		1		TNN6029A MICROPHONE CIRCUIT BOARD	0
1				TNN6252A MICROPHONE HOUSING AND HARDWARE KIT	0
	1			TNN6253A MICROPHONE HOUSING AND HARDWARE KIT	0
		1		TNN6254A MICROPHONE HOUSING AND HARDWARE KIT	0
			1	TNN6255A MICROPHONE HOUSING AND HARDWARE KIT	0

OL-DEPS-17641-A

PARTS LIST

TRN6029A & TLN4925A Microphone Circuit Board PL-3510-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%
C1	21-82187B08	220 pF; 500 V
C2	9-82987E11	.022; 80 V
C3	21-82187B44	.001; 100 V
C4	23-84742H09	15; ±20%, 20 V
C5	21-82187B44	.001; 100 V
C6	8-82987E02	.047; 200 V
C7	21-82187B45	470 pF; 500 V
		CARTRIDGE, microphone:
MK1	59-84640E01	miniature
		TRANSISTOR: (SEE NOTE)
Q1	48-869571	PNP; type M9571
Q2, 3	48-869594	NPN; type M9594
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R1	18-83083C34	variable; 1.5 meg ±30%
R2	6-129226	100k
R3	6-127805	15k
R4	6-124B14	470k ±5%
R5	6-129648	10k ±5%
R7	6-129707	2.7k ±5%
R8	6-131858	270k ±5%
R9	6-129231	3.3k
R11	6-129753	100
	NON-REFERENCED ITEMS	
	5-84371E01	GROMMET, cartridge
	42-84724E01	CLIP, grounding

TNN6252A (PL) & TNN6253A (Carrier Squelch) Microphone Housing & Hardware Kit PL-3511-B

S1, 2	40-84711E02	SWITCH, leaf: assembly S1 has 1 form A, 1 form B and 1 form C; S2 has 1 form A and 1 form B (TNN6252A)
S1	40-84711E03	assembly: includes 1 form A, 1 form B and 1 form C (TNN6253A)
	NON-REFERENCED ITEMS	
	3-136676	SCREW, switch mtg. 4-40 x 1/4 pnl hex
	1-80780B29	CABLE ASSEMBLY includes: 39-10184A24 LUGS; 5 req'd.
	15-84186E01	COVER, front
	15-84188E01	COVER, rear
	15-84191E01	HOUSING
	26-84720E01	FOIL, grounding, front cover
	26-84721E01	FOIL, grounding, rear cover
	38-84184E02	BUTTON, plain (TNN6253A
	38-84184E01	BUTTON, "monitor" (TNN6252A)
	38-84192E01	BUTTON, "transmit"
	42-84725E01	CLIP, shaft retainer
	47-84193E01	SHAFT, pivot
	47-84194E01	SHAFT EXTENSION
	47-84723E01	SHAFT COUPLING (TNN6252A only)
	22-82591C05	PIN, roll (TNN6252A only)
	64-84183E01	PLATE, base
	75-84722E01	PAD, base plate
	3-138809	BASE PLATE SCREW 4-40 x 5/16 phl bn hx blk ox
	3-138810	FRONT COVER SCREW 4-40 x 5/8 phl bn hx blk ox
	4-10058B10	WASHER ("TEFLON")

NOTE: Replacement transistors must be ordered by Motorola part number only for optimum performance.

TNN6254A (PL) & TNN6255A (Carrier Squelch) Microphone Housing & Hardware Kit PL-3573-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
S1, 2	40-84711E02	SWITCH, leaf: assembly S1 has 1 form A, 1 form B and 1 form C; S2 has 1 form A and 1 form B (TNN6254A)
S1	40-84711E03	assembly: includes 1 form A and 1 form B (TNN6255A)
	NON-REFERENCED ITEMS	
	3-136676	SCREW, switch mtg. 4-40 x 1/4 pnl hex
	1-80779B59	CABLE ASSEMBLY includes: connector, 28-83572F02
	15-84186E01	COVER, front
	15-84188E01	COVER, rear
	15-84191E01	HOUSING
	26-84720E01	FOIL, grounding, front cover
	26-84721E01	FOIL, grounding, rear cover
	38-84184E02	BUTTON, left hand (TNN6154A)
	38-84184E01	BUTTON, left hand (TNN6155A)
	38-84192E01	BUTTON, right hand
	42-84725E01	CLIP, retainer
	47-84193E01	SHAFT
	47-84194E01	SHAFT EXTENSION
	47-84723E01	SHAFT COUPLING (TNN6154A only)
	22-82591C05	PIN, roll (TNN6154A only)
	64-84183E01	PLATE, base
	75-84722E01	PAD, base plate
	3-138809	BASE PLATE SCREW 4-40 x 5/16 phl bn hx blk ox
	3-138810	FRONT COVER SCREW 4-40 x 5/8 phl bn hx blk ox
	4-10058B10	WASHER ("TEFLON")

NOTE: Replacement transistors must be ordered by Motorola part number only for optimum performance.

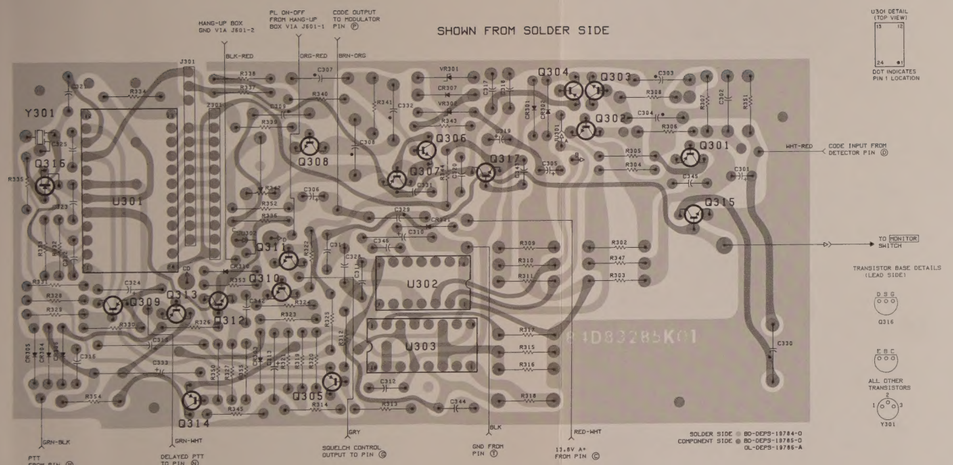
• 68P81030E06-B
• 1/76-NBPC

"DIGITAL PRIVATE-LINE" ENCODER/DECODER

MODEL TRN6207A

FUNCTION --

Encodes and decodes "Digital Private-Line" codes. Encoder modulates transmitter and delays transmitter turn-off 150 mS to allow transmission of turn-off code. Decoder detects received tone and unsquelches receiver when proper code is received.



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6207A "Digital Private-Line" Encoder-Decoder PL-3560-A

		CAPACITOR, fixed: ±F ±5%; 50 V; unless otherwise stated
C301, 306, 319	23-84665F92	15 +100-9%; 35 V
C302	8-82905C39	.023
C303	8-83813H23	.068
C304	8-83813H19	.0039
C305	23-84665F01	10 +100-9%; 35V
C307	8-83813H27	.0033
C308	8-83813H24	.016
C309	8-83813H14	.043
C310	23-82783B48	0.68; 35 V
C311, 312, 328	21-82187B20	.001 ±10%; 100 V
C313	23-84762H07	4.7 ±20%; 10 V
C314, 317, 318, 320, 333	21-82428B59	.01 +80-20%; 200 V
C315	23-82783B27	10 ±10%; 25 V
C316, 344, 345	21-83596E10	220 pF ±10%; 500 V
C321	21-83798B01	100 pF; 200 V
C322	21-840849	20 pF; 500 V
C323	21-82428B09	.0047 ±10%; 100 V
C324	23-82783B08	1 ±20%; 35 V
C325	21-82187B20	.001 ±10%; 100 V
C329, 332	8-83813H26	.0056
C330	8-82905C32	0.22 ±10%; 50 V
C331	21D82783B27	10 uF
C342, 343, 346	21D82877B24	220 pF
		DIODE: (SEE NOTE)
CR301, 302	48-84616A01	hot carrier
CR303, 304, 305, 307, 310, 311	48-83654H01	silicon
CR306	48C82178A06	germanium
		SOCKET:
J301	9-82071K01	female; 12 contact
		TRANSISTOR: (SEE NOTE)
Q301, 304, 305, 307, 309, 313, 314	48-869643	PNP; type M9643
Q302, 303, 306, 308, 310, 311, 312, 315	48-869642	NPN; type M9642
Q316	48-869653	field-effect; type M9653
Q317	48-869648	NPN; type M9648
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R302	6-124A95	82k
R303, 336	6-124A90	51k
R304, 327	6-124A56	2. 0k
R305		(factory selected)
R306, 307, 308	6-13755D64	56. 2k ±1%
R309	6-124A55	1. 8k
R310, 311,	6-124A73	10k
R312	6-124C59	2. 7k ±10%
R313, 328, 353	6-124C73	10k ±10%
R314	6-124C83	27k ±10%
R316, 332, 335	6-124B14	470k
R317, 339	6-124A75	12k
R318	6-124A89	47k
R319, 321, 338	6-124A99	120k
R320, 321, 324	6-124C95	82k ±10%
R322	6-124C89	47k ±10%
R325	6-124C49	1k ±10%
R326	6-124C43	560 ±10%
R329	6-124A81	22k
R330	6-124A93	27k
R331	6-124C97	100k ±10%
R333	6-124B04	180k
R334	6-124A77	15k
R336	6-124A91	56k
R337, 340, 341	6-124A97	100k
R342	18-84944C01	var; 2k
R343	6-124C33	220 ±10%
R344	6-124C37	330 ±10%
R345	6-124A53	1. 5k
R347	6-124B12	390k
R350, 351, 352	6-124C81	22k ±10%
R354	6-124A67	5. 6k
R355	6-124A65	3. 9k
R315	6S13755D80	82. 5k
		INTEGRATED CIRCUIT: (SEE NOTE)
U301	51-84267A82	type M6782
U302	51-84320A55	type NE565
U303	51-84320A79	type CA3096AE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Z301	51-82142K02	NETWORK: resistive
Y301	48-82003K01	CRYSTAL: (SEE NOTE II) resonator; 50. 00000 kHz
VR301	48-82256C34	VOLTAGE REGULATOR: Zener type; 11. 0 V
VR302	48-83696E07	Zener type; 6. 2 V

NOTES:

I. Replacement transistors must be ordered by Motorola part number only for optimum performance.

II. When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.

HANDLING PRECAUTIONS FOR CMOS INTEGRATED CIRCUITS

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

(1) Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

(2) Whenever possible avoid touching any electrically conductive parts of the circuit module with your hands.

(3) Normally, circuit modules can be inserted or removed with power applied to the unit. However, check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.

(4) When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

(5) All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe. Similarly, disconnect the test probe prior to removing the ground lead.

(6) If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through a resistance of approximately 100k.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

(7) When soldering, be sure the soldering iron is grounded.

(8) Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.

(9) When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.

(10) All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

(11) Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). NEVER USE NONCONDUCTIVE MATERIAL for packaging these modules.

EPS-18293-O

Two-Way FM Radio
150.8-174 MHz

68P81025E70-E